REPORT RESUMES

ED 011 042 VT 001 378

NATIONAL VOCATIONAL-TECHNICAL EDUCATION SEMINAR ON THE DEVELOPMENT AND COORDINATION OF RESEARCH BY STATE RESEARCH COORDINATING UNITS.

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PUB DATE 4 FEB 66
EDRS PRICE MF-$0.18 HC-$3.48 87P.

DESCRIPTORS- *SEMINARS, *EDUCATIONAL RESEARCH, *PROGRAM DEVELOPMENT, RESEARCH COORDINATING UNITS, *ADMINISTRATIVE ORGANIZATION, INFORMATION DISSEMINATION, *VOCATIONAL EDUCATION, COMMUNICATION (THOUGHT TRANSFER), AGRICULTURE, EDUCATIONAL CHANGE, CRITICAL PATH METHOD, COLUMBUS

THE PURPOSE OF THE 5-DAY SEMINAR WAS TO ASSIST RESEARCH COORDINATING UNIT PERSONNEL AND OTHER EDUCATIONAL LEADERS PLAN AND CONDUCT COMPREHENSIVE STATE PROGRAMS OF RESEARCH AND DEVELOPMENT IN VOCATIONAL EDUCATION. ITS SPECIFIC OBJECTIVES WERE TO (1) DEVELOP A CONCEPT OF RESEARCH AND DEVELOPMENT AND THE CONDITIONS ESSENTIAL FOR ITS SUCCESS, (2) DEVELOP UNDERSTANDING OF FUNCTIONAL ORGANIZATIONAL STRUCTURE, (3) IDENTIFY KEY INDIVIDUAL AND ORGANIZATIONAL ROLES, (4) DEVELOP AN UNDERSTANDING OF THE DYNAMICS OF PLANNED CHANGE, (5) STIMULATE EMPATHY AND SUPPORT, (6) ESTABLISH LINES OF COMMUNICATION FOR COORDINATING STATE, REGIONAL, AND NATIONAL ACTIVITIES, AND (7) PROVIDE A SETTING FOR SHARING IDEAS AND SEEKING SOLUTIONS. THE SEMINAR WAS ATTENDED BY 57 PARTICIPANTS FROM MANY OF THE STATES. AMONG THE PAPERS PRESENTED AT THE SEMINAR WERE "THE RESEARCH AND DEVELOPMENT CONCEPT - WHAT IS THERE TO BE DONE AND WHO CAN DO IT BEST," "IMPROVING RESEARCH IN VOCATIONAL EDUCATION," "STRUCTURING THE RESEARCH ENVIRONMENT," "ORGANIZING FOR IMPLEMENTING CHANGES IN EDUCATION, SOME IMPLICATIONS FROM AGRICULTURE AND DIFFUSION RESEARCH," "DISSEMINATION OF RESEARCH AND DEVELOPMENT INFORMATION," "APPLICATIONS OF PERT TO EDUCATION," AND "RESEARCH COORDINATION - WHAT LIES AHEAD." (JM)

ED011042

Research Development and Coordination

January 31—February 4, 1966

A Seminar Report

VT01378

THE CENTER FOR VOCATIONAL AND TECHNICAL EDUCATION • The Ohio State University, Columbus, Ohio

NATIONAL VOCATIONAL-TECHNICAL EDUCATION SEMINAR
ON THE
DEVELOPMENT AND COORDINATION OF RESEARCH
BY STATE RESEARCH COORDINATING UNITS

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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Division of Vocational and
Technical Education

1966

PREFACE

The rapid expansion of research and development in vocational and technical education has placed increased demands on the vocational education research community. The availability of Federal funds for research has been paralleled in many instances by increased funding from state and local sources. Renewed vigor and interest in research have permeated all levels of vocational and technical education.

Viewing the vocational education research effort in an organizational frame of reference, we recognize the critical role assigned to the State Research Coordinating Units. There are inherent in these evolving structures opportunities for effective leadership, coordination, and stimulation of research and development activities throughout the several states. The major purpose of this seminar was to assist personnel in these coordinating units and other educational leaders in planning and conducting comprehensive state programs of research and development.

We want to express our appreciation to the resource personnel who effectively contributed to the development of this purpose. Recognition is also due Dr. C. W. Hill, Professor of Agricultural Education at Cornell University, who served as coordinator of the national research seminar series, for his interest and assistance in this seminar. We would also like to acknowledge the work of the members of the Seminar Planning Committee and Dr. Virgil E. Christensen who served as seminar coordinator and who prepared this report.

We trust that this publication will prove to be of continuing assistance to the participants and to others who were not able to attend.

Robert E. Taylor
Director

INTRODUCTION

The five-day seminar reported herein proved to be one of the "stormiest" five days in the history of research. Blizzard conditions and abnormally heavy snowfalls beset the sessions from hours before opening until hours after the last departing participant's plane finally received clearance for take-off.

While snowdrifts on the outside piled high in a non-normal skewed distribution sixty of the sixty-two invited participants "plowed" their way through the most formidable problems of organizing and conducting effective Vocational Education Research Coordinating Units. To the Seminar participants, consultants and speakers, who made such noble efforts to keep the planned program on schedule, go our sincerest thanks.

The contents of this report are in several instances transcriptions from tape recordings made during the Seminar and as such are subject to the inevitable errors.

I appreciate the Seminar consultants' willingness to share their materials and trust that they, along with the reader, will understand and overlook any misquotes appearing herein.

V. E. C.

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PURPOSE OF SEMINAR:

To assist research coordinating unit personnel and other educational leaders in fulfilling their roles in planning and conducting comprehensive state programs of research and development in vocational education.

OBJECTIVES:

1. To develop a concept of research and development for state programs of vocational education and the conditions essential to its implementation and success.
2. To develop an understanding of a functional organizational structure for establishing and administering a program of research and development in vocational education.
3. To identify key individual and organizational roles and clarify their relationships to research and development activities.
4. To develop an understanding of the dynamics of planned change through research and its application to vocational education.
5. To stimulate empathy and support for research and development activities in vocational education.
6. To establish lines of communication for coordinating state, regional, and national research and development activities in vocational education.
7. To provide a setting where individuals might share ideas and seek solutions to common operational problems in vocational education research and development activities.

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SEMINAR PAPERS AND REACTIONS
BY CONSULTANTS

THE RESEARCH AND DEVELOPMENT CONCEPT - WHAT IS THERE TO BE DONE AND WHO CAN DO IT BEST?

by R. E. Jongeward*

Historically in America there has been the cry -- "There must be a better way!" Someone always builds better mousetraps. It is an American expectancy, especially among business and industrial concerns.

Until recently there have been two notable exceptions--the Church and the School. Recent religious stirrings reveal movement and re-examination of historic and traditional beliefs. For the first time in 800-900 years, Catholics may be eating meat on Fridays. It is even conceivable that Southern Baptists may soon drink in front of one another. Ecumenicalism is creating new patterns of worship and causing religious strangers to examine the likenesses and differences of one another's faith. The old-time strains of "Give me that old-time religion that was good enough for father" are fading into the yester-years.

Grandpa's little old red schoolhouse with its oxcart methods and single purpose curriculum is losing the nostalgia it once held. There is new life, new hope, new dreams of a modern, second-to-none educational system for everyone--including the poor and those whose color is less than white. Change, a word infrequently used and with little meaning among the now grey-headed educators, has suddenly burst forth with great force, almost engulfing student and teacher alike. The end is not yet in sight when the pace of change may be slowed. In fact, increased educational funds, a booming economy and a rapidly changing technology all point to an even greater tempo in the future. With over 50% of our population under 25 years of age, the restlessness and impatience of youth are easily seen in our schools, on college campuses, and on our streets.

It is little wonder, therefore, that we find ourselves somewhat bewildered and perplexed by the events of the day. We are awakening to the fact that we are living in one of Margaret Mead's "other worlds." Some are finding that they are being passed by, others and struggling to keep up with the vast complexities of our modern day. Hopefully many will successfully throw their arms about the problems of the day even though it is difficult to find mere hand holds.

---

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It seems entirely appropriate today, therefore, that we should consider getting recent research into action by examining what it is that needs doing, who should do it and how shall it be accomplished. This paper has presented an opportunity for me to express some personal opinions and observations about these questions. I have welcomed this since they represent my internal struggles over the past four years as Director of Educational Research in the State of Washington. As a result, you may find this discourse less than academic and not carefully documented from the research literature but rather (hopefully) a logical analysis of a series of alternatives that seems to lead to an inevitable conclusion.

Basic to my thesis is the premise that somehow, somewhere, sometime educational research should affect the student and the quality of the program offered. Granted, this is a narrow definition of research and not acceptable to everyone.

Perhaps crudely indeed, and at the risk of omitting important approaches to getting research into action, I'd like to examine four or five approaches to this basic idea that "there is a better way" and what effect they have upon the student and the teacher.

(1) This approach is one with which we are all familiar. It is the Higher-Education-Oriented approach to Educational Research and Development in which the College and University experts "do the research and tell the answers." (No quarrel with the need for University/College Research but recall the basic premise.) The thought here is that "experts tell, and everyone listens," or that "telling is teaching," or "listening is learning." Yes, it's true some people do listen and learn but widespread effect in practice is usually missing - why else the 25-50 year lag between discovery and application? Obscure and technical language usage has also acted as a deterrent to effective communication and general acceptance. Let's admit too, that familiarity with research has not been a strong emphasis in teacher education.

(2) A second approach may be thought of as the prescribed-curriculum-approach. Rigid state department rules and regulations may frequently represent this pattern. No changes can be made in methods, materials, or techniques unless they have been "approved" by the great white father in the state office. Students receive a sterile diet of packaged and safe knowledges. Teachers are rewarded for conforming to set patterns and standardized contents. This approach, too, emphasizes the listen-and-learn, telling-is-teaching concept. Changes are infrequent, resisted, and suspected if proposed. The boast can be made of such schools and situations, "Our schools are just as good as they used to be"--in fact, they are exactly the same as they were 50 years ago!

(3) The product-or-gadget-oriented-approach to educational change is a recent phenomenon that has sprung up with the advent of the "hardware salesman" and the "50-cent NDEA dollar." Here, the rigidity of the State Department approach is missing--so is the research from the College and University! There are also insidious elements at work here too. Keeping up with the Snob Hill School District provides sufficient incentive to order thousands of dollars of equipment--that was originally produced for industry and only slightly adapted for educational purposes--that is touted to launch a new era in educational practice by its flashy advertisements and smooth sales personnel.

Speed is the watchword in order to use the "cheap money" that is available now, and to be the first in the area to exploit a new breakthrough! Program objectives and planned evaluations are nonexistent and very soon thereafter dust is collecting on the equipment in the school storeroom or is discarded by teachers and administrators because maintenance costs were too high or the students absconded with vital components, rendering the equipment useless.

The profit motive, cheap money and the chance for quick reputations all combine to provide for rather widespread and quick spread of the innovation or change that accompanied the "new hardware." Little or no assessment of the effect upon the student was made, frequently the change was short-lived, and teachers felt guilty and somewhat "burned" for having been "taken in" by the gimmickry of the innovation. Most of them vow not to change so easily next time. Well-planned innovations will have a difficult time obtaining a favorable hearing in such situations.

(4) A fourth approach to getting research into practice may be identified as the "dissemination-of-research-information" idea. This is the belief that if all that good, solid research left untouched on College and University shelves could only be gotten to the consumer--the teacher--the problem of lag or gap between research and practice would be solved.

The problems with this plan are manifold. Methods of information retrieval are found to be very expensive, cumbersome, and not very efficient. Somehow, teachers don't read the valuable research journals, research reports, briefs and summaries that are prepared. If they do, very soon there are arguments among staff members on just "what does research say" on a given subject. They often conclude (not entirely justifiably nor unjustifiably) that we can prove any point of view with research--all we have to do is look long enough to find support for your own viewpoint.

When this discovery is made the teacher is encouraged to think that her own teaching stacks up with the best methods known to research; therefore, he is perfectly justified to continue, unchanged. As a result, the teacher becomes impervious to the changes that are happening around her.

(5) A fairly recent and new-to-education approach to improved educational method is now in existence. It's the efficiency angle. Cost-benefit analysis, used successfully in the military and in industry offers justification to some school boards and administrators to make vast changes in organizational structures, personnel utilization and instructional methods to effect greater economies in the school program. Unfortunately again for students, and for the quality of programs offered them, these techniques while they worked well when applied to things do not produce the same results when used on people (students). These methods have not been sufficiently tested or adapted to make them effective instruments in the hands of school personnel. There can be little doubt as to the need for careful cost accounting practices being adopted by education, but these must be carefully planned and tested before they are used.

Now that I have disposed one-by-one of many of the existing (there are more--and the ones mentioned may exist in various combinations) educational practices for instituting much needed changes and for providing improved program offerings, you may rightly ask--so how does he propose to do it?

My answer may surprise you . . . Honestly, I don't really know myself! I do have some clues, however, that appear to me to offer some promise. Let me suggest them.

Shall we be as personal as we can? In general, how do we learn? Do we modify our behavior (learn) more easily when we are favorably inclined (positive attitude) toward the task at hand? Do we modify our behavior more easily during or after we have been actively engaged in some activity or pursuit?

The answers, of course, are obvious and we have agreed to them for years. My question at this point is "Do we practice what we believe?" I think not! When we mount programs for getting what is known into immediate practice this is particularly the case.

Students frequently attend colleges and universities where it is do-as-I-say-not-as-I-do, rather than being actively involved in the process of learning, thereby gaining understanding by example as well. These students graduate, become teachers and only a handful discover (and probably accidentally) how learning takes place and soon become good teachers. Then school administrators, researchers, college in-service professors repeat the errors of the past by devising all sorts of schemes to get those staid teachers to change their methods, techniques and/or materials. When they don't, we can't understand why!

Active involvement is fundamental to the learning process (we learned in Ed. 101). Therefore, I must irrevocably draw the conclusion that if teachers are going to accept changes, adopt the latest research knowledge, or make basic changes and improvements in their programs then they must actively participate in the process that will enable them to learn and understand them, to develop positive attitudes toward them and finally adopt them as part of themselves. This seems so very basic if we realize that curriculum changes in a classroom actually represent changes (modified behavior) in people.

An R & D Example

The story is told of Winston Churchill during the year 1914 when he visited France and saw the beginning of World War I with soldiers in trenches and the use of other land fortifications. He returned to England impressed by the fact that an improved military technique for fighting such a war could include a movable platform from which soldiers could fight. He took this idea to Army personnel and after much discussion they rejected it as not practical. Tenacious Churchill decided that the idea still had merit and went to the Royal Navy and proposed they undertake research and development work that might lead to the development of this idea. They finally agreed and with limited funds began exploring the feasibility of devising such a vehicle. History, of course, reveals the success of this early R & D effort in the development of what we know today as the tank.

It is interesting to note that much of the original development by Navy personnel is still visible today. For example, the nomenclature associated with the tank denotes nautical connotations in a remarkable way, i.e., the body of the tank is known as the hull; the protection on the exterior resembled the armor plate of battleships; the tank weapons are found in turrets--other parts include such things as superstructure, bow, hatch and compartment.

At approximately the same period the Germans began thinking about developing a similar idea. German Army personnel conceived of their vehicle as a mobile fortress. As a result of this R & D effort the resultant tank became a very heavy armor-plated, extremely bulky vehicle, known as a tank, that had very little maneuverability in the field.

Shortly after these two developments, the Americans began exploring the development of a combat vehicle embodying military characteristics of firepower, mobility and crew protection. In this case the R & D effort was contracted to the auto manufacturers. Auto engineers perceived this vehicle to be a light, easily maneuverable weapon similar to the automobile of the day. In contrast, therefore, to the English and German versions of the tank, the Americans devised autos known as light tanks weighing only three tons and carrying from one to three men. The U. S. version that resulted from this experimental effort actually resembled an armored automobile.

This story leads me to conclude that the day of the classroom-teacher-researcher is at hand if we are to fully realize our objective. This person would actively engage in processes of inventing, designing, field testing, demonstrating and disseminating research within the confines of the classroom, the school, and the district. Planning for change or working in an atmosphere of planned change is essential for all of us in education.

In conclusion, the questions raised earlier in this paper must be answered as follows:

(1) Involvement of classroom teachers in research and research activities appears to hold the best promise of long-term educational improvement for students and programs.

(2) Who must do it? There is something for everyone--the College and University researcher, the State Department research office, and the classroom teacher. Above all, there must be excellent communication established among all participants and a wholesome team effort mounted if real progress is to occur.

(3) What needs to be done? Everything--the sky is the limit!

"Reaction to Mr. Jongeward's Presentation"

by Dr. Robert M. Worthington*

I. (Commenting on Ray Jongeward's statement that the teachers in the local school systems should be involved in research):

"I agree with Mr. Jongeward's remarks that the teacher is the key to our effort. The teacher of vocational education and any subject for that matter, will make or break the program. They must be involved. They (the teacher) are the ones who ask the right questions--they provide the feedback as to whether or not we are doing what we should do. I agree that in action research, the teachers might be reluctant to accept innovations that appear artificial and many people think suggestions for change are artificial if they didn't have anything to do with it--let's try to get teachers involved. As Stephen Corey says,"action research is research undertaken by educators in the field in order to improve their practices.' The NEA Association for Curriculum Development says that action research and the action research idea has so much to recommend it that we should strive for the time when a part of every teacher's day will be set aside for action research as part of his regular load."

II. (Commenting on the remarks of action versus basic research):

"Really a primary goal of research should be the improvement of institutions. Outcomes of action research are based on behavioral changes that occur in the teachers; the researchers themselves will change as a result of this. Practices do not change unless the teachers themselves change. Action research depends upon interaction between individuals and groups. This promotes free flowing of ideas, creating means first solving problems and good group dynamics. The teachers should become a part of the research team. This I think should be our major thrust in our educational effort in vocational education. There is no doubt that we need basic research to find or seek truth, but we need, it seems to me, to put a major thrust forward in action research getting teachers and school people involved as part of the total team so that the dissemination and diffusion will be built into our research efforts.

---

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IMPROVING RESEARCH IN VOCATIONAL EDUCATION

by Alan B. Knox*

I. Background

A. The purpose of the session this morning is to explore a way of thinking about the improvement of research related to vocational education, as one of the professional roles of the Seminar participants (referred to in this outline as RCU staff).

B. The purpose of this outline is to suggest some background ideas about working relationships between RCU staff and researchers within their state, so that the Seminar session can be devoted to a discussion of detailed strategies.

C. A helpful starting point is with the RCU staff member himself.

1. Although he may perform other important duties, it is assumed that one of his major responsibilities is improving the quantity and quality of research in his state, related to vocational education. (It is recognized that in another role the RCU staff may be the researcher, as with "in-house" research.)

2. "Improving" assumes some existing research activity related to vocational education, that should be considered,

3. The helping relationship between the RCU staff and the existing and potential research activity within the state
   a. is exceedingly complex
   b. varies from situation to situation
   c. requires empathy for the local situation and flexibility in working relationships

4. The role of "change agent" is proposed as a useful way of thinking about one of the major roles of the RCU staff, because the literature describing the "change agent" suggests
   a. a simplified basis for understanding the helping relationship

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    b. ways to diagnose facilitators and barriers in the local situation
    c. decision points in a long-range strategy by RCU staff

II. General characteristics of a model to better understand the social system of researchers with which the RCU staff would establish linkage.

  A. A model is a simplified system that contains the major components and dynamics of the more complex social system that we are trying to better understand.

  B. The parts of the systems model are interrelated components and not steps.

  C. For purposes of the present outline, it is proposed that the general concept of the "system" be thought of as the specific example of the University department of vocational education. (Other systems that might have been selected for illustrative purposes include a local school system or a state government bureau.) The "system" includes the researchers and their related staff, along with the formal and informal organizational structure within which they operate.

  D. A helpful way to approach a description of a system model for understanding how to improve the quantity and quality of research related to vocational education, is to begin with a list of typical activities of the RCU staff as change agent.

    1. In the improvement of research related to vocational education, RCU staff engage in the identification of
      a. agencies and units that are conducting and could profitably conduct research related to vocational education
      b. a desirable amount and type of research activity (objectives)
      c. the existing amount and type of research activity
      d. crucial gaps between the existing circumstances and the changed circumstances
      e. the activities or resources that are needed to close the gaps
      f. the combination of activities by the RCU staff that constitutes an optimal strategy

    2. Activities "a," "b," and "f" deal with the objectives of research related to vocational education in your state and this decision is not typically made primarily by RCU staff. (Other sources of objectives include: the interests of individual researchers; urgent problems facing teachers and administrators in the

field of vocational education; goals of institutions sponsoring research related to vocational education; guidelines of state and federal governmental units that administer programs related to vocational education; and policies of government research granting agencies and private philanthropic foundations.)

3. An understanding of activities "c," "d," and "e" especially can be increased by conceptualizing current research activities related to vocational education in your state (or a university within it) as a social system.

E. The proposed system model related to vocational education research has three broad aspects--input, output, and functioning of the system. Each of these three aspects will be described briefly below to indicate interrelationships and the input and output aspects will be described in greater detail.

  1. Output - The primary output that is of interest to us in the present context is RESEARCH FINDINGS. (A secondary concern may be that the research findings be in a form and be produced by a process that encourages utilization. However, it is important not to define "output" too broadly, so as to include all research related activity and ways to actively achieve adoption of findings, or "output" will include much of education.)

  2. Input - To achieve the output of research findings, three types of input are needed
     a. competent researchers
     b. priority ideas
     c. money to buy time

  3. Functioning of the system - There are many factors that contribute to the levels of productivity and satisfaction that characterize a social system, (e.g., the flow of important communication between persons within the system that contributes to coordination; and the relative level of satisfaction and continued cooperation that results from the balance between what the individual contributes to the achievement of organizational objectives and the set of incentives and rewards that he receives). However, this point will be dealt with in the presentation by Dr. Joos, and the remainder of this outline will concentrate on the relationship between the RCU staff as change agents in relation to the input variables.

III. The major output from the system is findings from excellent research. To increase the quantity of inadequate research would be of little benefit to anyone. Research findings are defined as tested knowledge from which we may generalize. (It is recognized that useful research related activity such as evaluation or utilization or preparation of researchers may precede, accompany, or follow research.) The process of producing tested knowledge typically includes

  A. identification of a question or problem where present knowledge is inadequate,

  B. development of a tightly reasoned rationale that explicitly states how the researcher is conceptualizing the problem, based on previous experience, research, and theory,

  C. statement, at critical points in the rationale, of predictions of anticipated relationships,

  D. collection and analysis of empirical data that is most pertinent to test the tenability of the predictions and is most representative of the situations to which the researcher would generalize, and

  E. presentation of precisely stated conclusions which, if the research is successful, constitute tested knowledge from which we may generalize.

IV. Three major types of input are proposed

  A. The most crucial type of input appears to be an adequate supply of competent researchers who are interested in topics related to vocational education.

    1. It is assumed that educational research is becoming increasingly complex and to conduct it in a way that produces tested knowledge from which we may generalize requires a competent researcher. To become a competent researcher requires substantial education and experience related to research theory and methods.

    2. There are three basic ways in which to increase the present inadequate supply of competent researchers who are interested in topics related to vocational education

      a. encourage the competent researchers who are currently engaged in research related to vocational education to devote more of their time to this area of activity

      b. encourage competent researchers who are not engaged in research related to vocational education to pursue questions in this area

    c. increase the supply of competent researchers who will pursue questions in this area

3. The crucial question is what can the RCU staff do to most effectively increase this input? (We will return to this question at the end of the outline as a springboard for discussion.)

B. Priority Ideas for Research. The process of research is seeking answers to researchable questions, the understanding of which will contribute to the solution of pressing problems in the field of vocational education.

1. Uses of priority ideas for research
    a. to contribute to the solution of the most urgent problems
    b. to initiate researcher interest and activity related to vocational education
    c. to obtain other needed support for research

2. Sources of priority
    a. points to urgency for the consumer of research, such as might be identified by the critical incident technique
    b. theoretical attractiveness to the researcher, because the idea has potential for innovation, specific application of broader concepts, and theory building

C. The major function of money as an input is to buy time of the researcher, related staff, the computer, etc., that is needed to conduct research.

1. The typical way in which to obtain money to buy time is to prepare a sound research proposal.

2. Two major ingredients in a sound research proposal are a priority idea and a competent researcher.

3. The present availability of money to support research related to vocational education is greater than ever before, and may even exceed the availability of competent researchers and priority ideas.

V. Questions related to the role of the RCU staff in encouraging more, excellent research related to vocational education, that will obtain tested knowledge from which we may generalize.

1. Is the concept of the change agent role of the RCU staff, as they work with present and potential vocational education researchers, an appropriate and useful one?

2. To what extent does the interrelatedness of our most pressing problems justify the use of a system model?

3. How warranted is our assumption that the need for research related to vocational education far exceeds the supply? How about the demand and utilization?

4. How necessary to the improvement of research related to vocational education is increasing the amount of time by competent researchers that is devoted to topics in this area?

5. If crucial, then how can we identify the actions by RCU staff that would most effectively increase this time commitment? (Most promising alternatives.)

6. What existing circumstances provide the major source of resistance to increasing research time on vocational education topics?

7. What existing circumstances most facilitate the improvement of research in vocational education?

8. What additional incentives can be added to the system?

9. Which resisting factors can be most effectively minimized and which facilitating factors can be most effectively maximized by RCU staff?

STRUCTURING THE RESEARCH ENVIRONMENT

by Loyal W. Joos*

I am quite aware that this seminar has to do with research in vocational education, which some think is a subdivision of education; and in spite of that I choose to talk about stimulating educational research, because I think of all education as having a vocational aspect, and also because I believe that the processes which will encourage research in vocational education are generally applicable in the general educational context. Let us begin by stating that the research enterprise needs a lot of stimulating throughout education. It may seem to you that we in vocational education are vastly behind the general research progress in other educational groups. If so, I mean to bring you to think otherwise, because I believe that most of what passes for good research in education suffers by reason of certain lacks in basic philosophy which are less troublesome to us in vocational work than they are to those whose field may be described as educational psychology; yet it is in psychology that the research reports are found which are often cited as models of good research.

For my part, I think of educational research as some systematic procedure carried on for the general purpose of adding to our store of useful educational knowledge; and I define useful to mean that the use or possession of the knowledge will improve the educational process in one or more of several ways. We can think of improvements to input, to process, to output, and to utilization. Ideas related to quality, quantity, and efficiency are all part of the picture of improvement. I believe, for example, that if we were to apply the power of the modern computer to the problem of the logistics involved in the school lunch program, to the end that better meals were available at 75% of current cost, that this would be a contribution to education and a valid use of a researcher's time. On the other hand, proving that better hot lunches increased learning rate I would regard as interesting but of considerably less importance.

I am to discuss with you some ways in which research may be stimulated; and I am going to avoid almost entirely the kind of research which is conducted in, for, or by colleges and universities. I shall be talking in terms of that research often labeled as "action research," apparently because it is done by some one who is active in education such as a teacher, supervisor, or school principal; rather than by someone who used to be active and is now removed to some (presumably) higher level. More about this later.

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It will be seen that the efforts that might be made to provide a good research climate can be effective only if they are made by the right people; the researcher cannot provide his own climate for research, and he who does provide it is not likely to have been a researcher. So if you are not a researcher, but an administrator of some sort, then you are the one I want to talk to - but I want to warn you in advance that if you do this thing well, you will not be able to remain outside the process. You have to become involved. For example -

Structure Basic to Research

Structure has to do with the game and its rules. In this case the game is vocational education, and the rules say who shall be allowed to participate, under what conditions, and for what goals. What are the goals of vocational education? How can you tell when you are winning? We have not done a very good job at stating the rules of vocational education, but we have done a lot better than has been the case in, say, educational psychology.

If your rules say that the object of the game is to train people for gainful employment, you have a rather specific measure of success. You could do some reliable studies to show how well you played the game. Unfortunately, such specific and narrow-gauge structure will tend to throttle research of such questions as "Are the right people being trained?" "Is vocational training productive of general skills?" or some others you might think of.

In building a structure for research in vocational education, we must begin by re-thinking the whole purpose and philosophy of vocational education. Further, we must write all this thinking down so it can be read and studied by the practitioner, so that the teacher in the classroom can see that what he is doing is not instructing a boy merely how to drill a hole without breaking the bit, but educating him to an awareness of the total significance of that process. The reason is simple: unless the practitioner is aware of the whole problem, he can do little useful thinking about better ways to attain the total goal.

Of course you could attempt to stimulate research just by saying to the practitioner, "I want you to study what you are doing and try to think of better ways to do it. I'll give you extra time, and even reward you with a promotion if your research report looks good." I don't think this will work, but even if it did, the result would be that you would soon have to choose between letting him take over your job as a leader or telling him that you have changed your mind, and he can stop thinking.

No, as a leader you are also the keeper of the rules. You make the philosophy of vocational education, and without a philosophy (or theory) research is impossible. You begin with theory, develop one or more hypotheses from the theory, set up a systematic test of the hypotheses, and attempt to reconcile the results with your philosophy. This is fundamental, and you must see that it is done.

Provocation as a Stimulus

Now that you have done all this heavy thinking, your problem is to get some practitioners involved. You might try provoking them in the manner of Dr. Conant or of Admiral Rickover; except that research designed to prove someone wrong is rather sterile exercise. I would recommend, instead, a combination of skepticism and faith. Let people know that you are skeptical of the present ways of doing things, but that you have faith in their ability to do better. Please notice that if you have properly structured the rules, "doing better" will have been defined. The skepticism may stimulate some research into the question, "How badly have we been doing?" and this will very soon, of itself, produce some obvious ways of improving.

Some years ago, for example, a researcher was given the task of studying the vocational agriculture departments in Baltimore County, Maryland. The problem was simply stated: Should Baltimore County continue to offer vocational agriculture courses in Franklin and Hereford high schools? Now Hereford was (and is) the oldest such department in the United States. Yet he discovered that it had never served the purpose for which it was established, for the reason that most prospective farmers dropped out of school before the 10th grade, which was the earliest opportunity to enroll in vocational agriculture. As a result of this research, a plan was finally (after 40 years) set up whereby 9th grade boys could enroll. There are several lessons which could be drawn from my example, but I will mention only one, which is that it is not enough to draw up the rules; someone has to keep score. Of course, keeping score means more than filing state reports. I sometimes think that we could learn a lot from the sport's world, where we find that a baseball manager has detailed statistics on every major league player, including the number of times he has swung at a low outside pitch.

I know that when the climate is right for research, the practitioner who is uncomfortable with the job being done has an alternative. He doesn't have to get out of teaching in order to become fulfilled; he can instead experiement within a broad and permissive structure. He can be allowed to think and to innovate; indeed he can and should be aided and abetted. First, however, you have to stimulate some action, and a good way is to provoke people by setting the dogs on as many sacred cows as possible.

New Categories for Old

There is a useful habit of thought which operates by labels and categories. For example, we call education vocational when it intends to train people for employment, and when we talk about various methods or plans of operating, these tend to be labeled with the names of people or places, like "the New Jersey plan," or "Rogerian counseling," and the like. As useful and convenient as this may be for talking about what has been, it is a straight-jacket when it comes to research and innovation, because fresh ideas and methods tend to be lumped into old categories and forgotten. It is too easy to give a new thought only cursory consideration, just enough to say, "Oh, that's the same thing that Smith tried in New York in the twenties. Didn't work out."

Unfortunately, educational literature is full of these dead categories; they are in fact embalmed and preserved in textbooks used to teach our teachers about education. It almost seems that some professors care less about the utility of a thing than about the students being able to identify the label of it. Suppose, for example, we were to talk about a linguistic method of teaching reading. Nineteen out of twenty reading experts will say, "Ah, Bloomfield!" and quit listening.

Now, if the researcher in education is to have an adequate "label structure" in his thinking, he must have a lot of extra categories handy under any general heading so that he is quite prepared to put a different label on each fresh "linguistic method," or each fresh idea in vocational education. It may turn out that the latest thing to come to attention is the same old idea that has carried two other labels before, but you can't afford to say so until you are sure, and perhaps not even then. Nothing so discourages the neophyte in research as to be told "that's been tried before," and nothing is so infuriating as to hear this from someone who hasn't really listened long enough to know what is being said.

A Time for Research

The Bible tells us that there is a time to live and a time to die, along with a time for everything else; research is a notable exception. I can tell you from experience that it is always too late to begin a research project. Perhaps the trouble is with the notion that research is done in projects, while education just keeps on going endlessly. In the case of research conducted by practitioners, the first obligation of the teacher is to conduct the prescribed program. If nothing is introduced to break the rhythm, the daily, weekly, and yearly round will continue without much change.

At present, the research efforts of practitioners usually result from the necessity of fulfilling the requirements for advanced degrees. Such research is usually a one-shot affair; with the requirement fulfilled, the research is terminated, never to be resumed. In most cases this is a good thing, because a first try at research is likely to be fairly treated if buried with as little fanfare as possible. In those instances where the degree-seeker does more than the minimum of research, the usual thing is that he has left the active field and has been drawn into the halls of higher learning, and so has passed out of my consideration of active researchers.

The cooperative research program of the U.S.O.E., and more recently certain other acts of government,have provided in the first case the encouragement and opportunity to do research, which tended to be initiated by college and university personnel; and in the later cases a kind of mandate to research and/or evaluate which is undoubtedly the reason that we are here today. The recent expansions of research efforts have revealed an interesting thing, and that is the very poor fit between traditional research technology and the tasks which face the researcher in practical educational fields. Small sample studies, based on the normal probability model, are woefully inadequate for our needs today; I shall have more to say on this another time.

These stimuli to research are, I presume, introducing "breaks in the rhythm," which I mentioned earlier. Research must be conducted, if not because the federal aid rules require it, certainly because the shifting educational situation requires valid information of a very practical kind. Some of us are learning right now how to design and conduct studies undreamed of five years ago. I have personally conducted an analysis on survey data composed of responses from more than 485,000 people, and summarized these data in usable form in a matter of one day. In order to conduct evaluations of new methods and curricula, we have set up procedures which consider data at a rate and complexity which exceeds anything attempted by any of the testing companies in the U. S. ten years ago, and we do these things in order to help our teachers and supervisors with today's problems. We provide a possibility of continuous assessment of school programs in order to provide an information base for prompt program planning and revision.

A Way to Live with Research

In Oakland Schools, we are learning how to live with research. Since it is no longer something you can take or leave, or even take from time to time, we take the long view; we live with it. This means that practitioners have as a requisite service, the use of competent system designers and technical consultants. The know-how is provided, not only to do the job but to teach the practitioner to use and control the whole process.

Hopefully, the result of such efforts will be the development of a new kind of school administration, one in which research and evaluation is not only a tolerated part of the process but is the very sensory organ which guides administrative progress. This is only possible if and when technical assistance of a high order is provided, together with good data processing capability.

These prerequisites of research are built into the administrative organization, and occupy a unique position in staffing, in that the research staff is independent of other staff functions. In this way, each other staff person is free of organizational restrictions in using research technological services. Likewise, the research staff has no direct responsibility for conducting other administrative functions.

This sort of staffing structure results in the responsibility for initiating research activities resting with educational practitioners and their supervisors. The services of the research department are as available to a teacher who wishes to design a study of method as they are to the administrative head who wants a design and program for a long-range study of educational efficiency. But in neither case does the research technologist initiate the study.

Communicating about Research

One of the best reasons for conducting research studies in the situation and the context of the education practitioner, is that which has been called the principle of involvement. This principle is simply that it is easier to inform people about research when they have been involved with it as it took place. It is true that there is an apparent bias among educators to place more value on the word of experts from afar than upon their own experiences, but this bias is more effective when it comes to planning group activities for in-service training than when planning next year's staffing pattern in the school.

A complementary feature of the principle of involvement is that good research activities tend to attract kibitzers from other places; people who have come to see for themselves that new program being tried in the hinterland. This adds status and even glamour to research involvement.

Of course, research is of little effect without publication. Here again the uses of the past are not adequate, because the nationally distributed professional journals are insensitive to the needs of local school researchers. Of course, it is an excellent thing to be published in that way, but such publication is too slow, too costly, and too undependable to begin to do the publication job needed. In any case, the first task is to prepare a research report for the use and edification of those who are directly concerned. Mimeographed or photo-offset reports are useful for this purpose.

Don't stop with merely local distribution of your report. Mail them to libraries, local institutions of higher learning, and your professional colleagues everywhere. Always mail them only to people by name, and let it be known that additional copies are available. The costs of such self-publication should be justified as bread upon the waters.

There is a saying in academic circles that one must publish or perish. I would caution you not to do both. The quality of your research will be evident to the reader of your report. If it is good research, poor reporting won't kill you, but it will reduce the number of people who want to hear about it. Some people get by for years by hiding poor research in glossy reporting, but that's unprofessional. My own test of good research publication rests on the local reaction to it. If local people are motivated to undertake further steps in research because of what has already been done, your communication is a success, and so is the research.

Financing Research

There are plenty of people who know more about soft-money financing for research than I do. Soft-money is the kind that is obtained on a project basis, usually from some "outside" agency like the government or a foundation. It is money that is to be used only for that particular project, and it may or may not be extended or augmented if the project needs more money or if it leads to other projects. It's soft because you can't use it to build up a permanent research staff or facility unless you are good at maintaining a continual flow of more soft money. Soft money has the further disadvantage that the source of money usually has some way of keeping a string tied to the researcher for the purpose of ensuring that the research results meet some previously determined expectation.

The structure I have been talking about is based on hard money financing of a research staff, but it does not preclude the use of soft money for particular projects. Here again, the responsibility for project financing rests with the initiator of a project. Of course, if the initiator is a classroom teacher, soft money financing will not be obtained without including an administrative person (other than the research staff) as an applicant, in the name of the corporation, for project funding. This is probably a good thing, because teachers can't initiate research without administrative help--if they do, they will get administrative hindrance.

Hard money financing of research should include money for teacher-initiated research. Usually the costs are very minor, and the extra time that local teachers will devote to such research is clear gain to the corporation.

There is more to research than getting it funded as a project, as many people have learned to their sorrow. Once you begin a research project, it should be followed through to the end. It may seem all too obvious to say that you have to look ahead to see what that end may be, before you begin; but that is just what many people fail to do. These unfortunates find themselves, one fine day, the possessor of a pile of unprocessed data, and they don't know what to do next. They had failed to look ahead. Occasionally it happens that such a person never recovers from the experience. As Shakespeare says, "the play's the thing." Don't let your skill as a fund raiser get you into a game you can't play.

"Reaction to Dr. Joos' Presentation"

by Dr. Gordon I. Swanson*

I am reminded, first of all, of the college counselor who was speaking to the high school graduate who came to him to see if he should submit an application for admission to college. The counselor said, "Are you in the top 10% of your class?" and the student said, "No, but I think it's possible." I think as Ray told you at the outset that this (Joos-Swanson) is a pupil-student relationship--one that makes one of us possible. And because of this previous relationship I have had with Dr. Joos, I can tell you some things that others wouldn't be able to tell. Now, while Dr. Joos has no vices, he does have some sets. One of them is to get my goat and the other is to take an extreme position just for the effect of the position. You will note that in his paper he pulled in an extreme amount of pragmatism and for this he expects your questions. He got in a little bit of Conant and the Ancient Mariner crept in. I should also tell you that what he says he believes. He did make the conclusion that I hope you drew, as I did, that there's no question that we're going to be involved in research in vocational education. The question of whether or not we're going to be involved is not a question at all; the only question is whether we're going to do it well - how we see the rules of the game; how we see the game in the first place and how we keep the score.

I have just a few comments I would like to make on his paper. He began, you recall, with this disclaimer of who was an active researcher and he said that anyone who did the kind of research which is conducted in, for, and by colleges and universities, this cateogry he would avoid; and this he removed from the category of active researchers here is an area where he expected to get my reaction--and I'm going to give it to him. The college and the university is one of the only institutions in this country that employs the supply of manpower that is prepared with research degrees. It is one of the only institutions that is in the business of absorbing the kind of research confidence that Dr. Knox talked about this morning. Now, it is true that school systems do employ people who have research degrees and the Pontiac system is a good example. Indeed, it is an unusual example, I believe, because in the field of education, compared with almost all other fields of research, there are very few people spending a full career in research. Usually, research is a part of an academic career. How many people do you know who are spending a full professional career on full-time research? You find them by the score in the field of physics, or mathematics, or in chemistry. You can find them in the space and defense industries, but in education how may do you know that are spending a full professional career in research? And if indeed there are institutions who are willing to employ people who want to spend a full professional career in research in education, where are these institutions? And what are the most likely institutions? What time can you buy in researchers and in what institutions may you find them?

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It seems to me that any time we consider the research component of any field, or whatever game we're playing, and if we want to enlarge this, we need to capture the time of competent researchers. And we have to capture the time wherever we can find the researchers. It seems to me that there is an important body of energy going on someplace by people who have achieved some level of competence. It's important not to avoid this research effort in colleges and universities. He'll come back at me on this, but this you understand was a disclaimer at the outset.

He also pointed out,and I think rather properly, when you do describe the rules of the game that you do not describe them narrowly, because then you restrict the kinds of questions which should be asked. He mentioned that the object of vocational and technical education is to train people for gainful employment and we have a rather specific measure to success. When he said, "do not look at this narrowly, look at it broadly," I would suppose that he would suggest that even the Dictionary of Occupational Titles has a great many titles that are not really filled according to the labels that are presented there, and there may be a great many occupations that are not found in the Dictionary. He also emphasized, and I think quite properly, that the ultimate as well as the immediate goal is terribly important. And then one might question where the ultimate goal ought to be examined - whether the ultimate goal ought to be examined by the person who is teaching at the elementary or secondary level or where this practitioner can be found. And practitioners, I presume, includes anyone. He also emphasized, and I think quite properly, that you cannot ask the question in this way: "I want you to study what you are doing and to think of better ways in which to do it." He said this would lead to rather sterile kinds of questions being asked. And I think this is very, very appropriate. I think we have some good illustrations in modern industry to draw that this has been the approach by some industries and that it hasn't worked very well. The railroad industry was doing its best to restrict its own racket; to see how it could do a better job of carrying freight. It was trying to improve the schedules, trying to make rounder wheels and so forth, and in so doing they completely forgot that the airlines business was doing something else. And now, the airline business has stolen the railroad's passengers. There was a different school of practitioners operating at some other institutional level. And you've heard the old saw about how to improve illumination. It would have been quite possible for the manufacturers of lamps to make wider wicks, bigger globes, and larger lamps, and if this had been the only effort the light bulb would never have been discovered. There is a different level of practitioning going on and it seems that in the field of vocational education, one needs to harness up all the energy available, wherever it is and at any level of innovation. Joos emphasized this; also, a need for establishing an appropriate theory, and here he agrees with Knox.

He said that there appears to be a system and a moving system; in other words, you cannot drive two stakes to see where this is going, because in a moving system the stakes are also moving as well as the system. Theory is important and merely doing better is not sufficient until you define what is meant by doing better. He mentioned the fact that one of the ways to stimulate research is to attack the "sacred cows" and he said that this would provoke people. Here perhaps is another place where I could come back to his avoidance of colleges and universities and even state departments of education. Maybe it would be quite appropriate to examine "sacred cows" wherever you find them. I have a personal feeling that many of the courses in colleges of education that are entitled measurement, measurement in education, should be re-labeled. These are incorrect labels. They should be called "Measurements of Psychological Variables in Education" and then admit that there is no course that teaches people how to measure sociological variables, or economics variables, or cultural variables. To be thus more honest to use a limiting label rather than a general one. And, there may be some advantage in this for vocational education, because it is possible that the difficulty (for example, the difficulties of getting even the poverty program,at least its educational aspects off the ground) is the fact that we are measuring the wrong thing. Or at least maybe we have no way of measuring the right thing? This is a personal bias of mine that we might discuss later. At any rate, it seems to me that a great many of the variables that need measurement, we can't measure--we only categorize. This is no criticism of the area of educational psychology because there they can measure; primarily because the instrumentation has had more work. There are many areas of education where instrumentation is not in good taste for the kinds of problems we want to deal with. It does seem to me that the development of instrumentation would be a good role for research coordinating units--if they can stimulate this kind of work. And I also have the feeling that the practitioner in this case is located in a different institutional arrangement.

He also gave some attention to the role of categories and labels. And here he moved back to the discussion of theory, or to the game we're playing. As a matter of fact, it's possible I think, when we're talking about labels and categories to say it's almost impossible to talk about education itself without talking about only the forms of education, in the same way that it's almost impossible to talk about religion, whether it's the gospel according to Knox or Joos, etc. In religion we talk about the forms of religion and it's almost impossible to talk about religion without talking about its forms; and labeling thus, merely identifies the particular form we're discussing at the moment. While it's true that maybe some of the labels ought to be renewed from time to time, they are a deterrent but also an asset and they can work both ways. We hope they are descriptive, but they're not always descriptive. Some of the labels that we think are most descriptive are not descriptive at all; some that we accept so fully and completely. We are on the campus of a "Land Grant University." Try some time to translate that term into another language; yet we seem to know what it means when we use the label. Try translating it into Spanish or French or some other language that you know.

This is about all of the comments that I have to say except that Dr. Joos did emphasize the high level of competence needed and this was an emphasis which I hope will continue in the RCU efforts. And he did not end up by saying something about hard money versus soft money. This is an administrative question, that I think is exceedingly important. I don't know whether we should get into this here or not, but I do believe that it is terribly important to learn how to use soft money as though it were hard. That it's impossible to have a very sizable research program on only soft money if your operational program is on hard money. This puts the whole thing out of balance and I will agree with him completely that too much can be risky--the risks of success in getting money can put high risks on research itself and I'll wind up by saying that maybe one of the most risky things that could happen to any RCU would be for all of them to be successful and each given a million dollars the next time they try; this could kill them off, because there probably isn't enough of the in-put kind of things that Dr. Knox was talking about to do a good job with the output that should be expected from that kind of resource.

ORGANIZING FOR IMPLEMENTING CHANGES IN EDUCATION; SOME IMPLICATIONS FROM AGRICULTURE AND DIFFUSION RESEARCH

by Herbert F. Lionberger*

This paper is directed to the broad problem of organizing effort for implemented change in education with inferences that may be drawn from organizational methods used in agriculture and from the various diffusion research traditions.[32,62]

Basically the problem to which we are addressing ourselves is little different from the one central to the operation of agricultural colleges in which rural sociologists have worked; namely, that of developing, validating, and disseminating scientific information to students and the public.[20]

Diffusion research, which I claim as my main area of specialization has been defined as "(1) acceptance (2) over time (3) of some specific item, idea of practice (4) by individuals, groups or other adopting units, linked (5) to specific channels of communication (6) to a social structure, (7) and a given system of values or culture."[31] The earliest research done in the agricultural diffusion research tradition was by the Cooperative Agricultural Extension Service, which was charged with the responsibility of disseminating accumulated scientific information from research sources to farmers who could make use of it. Rural sociologists became involved in the early 1940's after which several hundred studies have appeared, mostly of recent date.[63] Other diffusion research traditions developed somewhat simultaneously or later in anthropology, public health, education, and in business, with a tendency to corroboration of findings from the various traditions in recent years.[28,31]

Speaking primarily of the agricultural diffusion research tradition for which rural sociologists were primarily responsible, attention was directed mainly to the adoption of rather simple agricultural practices by individuals and to decisions of a rational, deliberate nature; also, to channels of communication and influence involved in the acceptance processes as well as to the way in which adoptions aggregated in localities. Before enumerating generalizations and concepts from this tradition which may have a bearing on the adoption of innovations in education, some basic differences between the two should be noted, both with immediate utility of findings on the one hand and organization of effort to enhance adaptibility of school systems in view.

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Differences and Limitations

(1) In agriculture, individuals are the adoption units. Although in the final analysis individuals must decide, school systems are also in a sense adoption units.[27] The school superintendent or administrator has been the focal point of research with considerable difference of opinion expressed in regard to his potential role as a change agent.[25,74,11,23,62,16] Whatever this may turn out to be, he certainly is subject to more social pressures from outside influences than farmers who have been the focus of attention in diffusion research in agriculture. Yet, the administrator is the authority figure in the system, which means both he and the system can be highly instrumental in implementing change.[11,74,50]

(2) Rewards to farmers who adopt new practices are much more direct, easily ascertained, definite, and perhaps less subject to unanticipated consequences to the adopter than innovations in education. A farmer can save money, make more profits, save labor or time, or derive other benefits of direct and easily assessed benefit to him. Even worse, the teacher or administrator may become a victim of his own innovative effort. Pay increases and promotions are made mainly on the basis of years experience, college degrees and perhaps, on ability to keep things running smoothly, not on innovation. In fact, one study has shown that innovation is very little a part of a teacher's conception of what it takes to make a good teacher.[54] To moralize a little, it would be unfortunate if adaptive efforts in education are not favorably recognized and rewarded, considering the need for such innovative effort.

(3) Teachers and administrators may be more vulnerable to devaluation of existing skills than farmers and at least some professionals because of changing technology.[25] Furthermore, positive incentives for the acquisition of new skills may be quite lacking; also, the means of eliminating or even bringing effective pressures to bear on laggards. The farmer who is not alert to changes in farming and who does not adopt improved farm practices readily is likely to be eliminated. Negative sanctions do not operate to the same degree and manner in education as in agriculture; also, teachers may actually exert pressures on others not to adopt changes which will inconvenience them.[42]

(4) Most of the diffusion research in agriculture has been directed to relatively simple agricultural practices which can be adopted individually. However, those in education are often more complex, less visible, and more difficult to assess from a utilitarian point of view.[50,62]

(5) Organization for change is different. Many differences between implementing change in agriculture and in education stem from the way each is organized for that purpose. In agriculture, functions,

operation, and organization are highly institutionalized in contrast to education.[20] To be more specific, organization and testing of scientific farm information under field conditions and communicating it to users is a special function manned by specially trained professionals in an organization that is designed for that purpose. Passage of the Hatch Act in 1887 clearly moved the development of agricultural information from the realm of folk knowledge to the laboratory or experiment station where scientific methods are applied to developmental and testing efforts.* Passage of the Smith-Lever Act in 1914 establishing the Agricultural Extension Service clearly recognized that disseminating information and practices was a specialized business for which specially trained personnel, well-directed effort, and an appropriate organization was needed. In addition, many linkages with other systems** which assist in the information disseminating efforts were established. At the receiving end of the line, confidence has been developed in what is offered, a continuing expectation of new things to come, and habits of using facilities and information outlets from the central system.

Another unique feature is attention to application skills and provision of specially educated change agents. They appear to be regarded as essential to any substantial program of directed change, e.g., soil conservationists in soil conservation, county directors in extension education, community developers in community development, health educators in public health to mention only a few. Yet these functionaries would be almost useless without the supporting systems in which they operate and without perfection of their respective roles as intermediaries between systems which create scientific information on the one hand, and the potential users on the other.[56,76,77,19,7]

Whoever controls supplies can greatly influence innovative behavior. In this country, supplies for agriculture have been taken quite for granted with the free enterprise system quite adequate to provide what farmers need when they need it. In developing countries, this has generally been combined with the extension education function. However, in introducing new supplies to farmers, such as agricultural chemicals, experiment stations have often been used as legitimating devices. Thus, some commercially developed products are tested by the various experiment stations. Conceivably, supply systems operating quite independently from research and development can either facilitate or inhibit acceptance of innovations, e.g., textbooks can materially influence curricular offerings. Commercial agents may emphasize unique features to sell their products and in turn impede change by reinforcing decisions to retain the obsolete, a practice which has some utility for the user also.[50]

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*Wiles has suggested that similar shift took place in education about 1957 when innovation in school curricula was removed essentially from individual responsibility to a coordinated emphasis on directed change agents outside of school systems.[75]

**System is defined by Miles as "a bounded collection of interdependent parts devoted to the accomplishment of some goal or goals, with the parts maintained in a study state in relation to each other's and the environment by means of (1) standard modes of operation, and (2) feed-back from the environment about the consequences of the system actions." (48, p. 13)

Some Implications from Agriculture for Organizing Implemented Change Efforts

The prior organizational situation organizationally is a consideration in developing plans for directed change in education as in anything else. In education there is no wealth of experience as in agriculture for organizing and directing such efforts, but neither is there a tradition to hamper new developments; this despite the diverse and complex organizational aspects of education in the United States.* Attention could be focused on the organizational requisites at this point, but consideration of the necessary functions probably would be more fruitful. Thus, four are chosen for consideration:

1. Originating and validating scientific information and innovations.
2. Disseminating innovations and information to potential users.
3. Teaching skills to change agents and potential adopters.
4. Legitimating innovations and information.

Some might add integration of innovations into the life patterns of adopters as a function.[23,62] I am subsuming this as a part of adoption.

1. Originating scientific information. The first concern is with the development of innovations. These derive generally from invention and borrowing. Certainly no opportunity should be lost to borrow but greatest reliance must be on invention. Some innovations might come from folk knowledge or practice. For a long time farmers insisted that one learned how to farm by farming, and that new developments in farming came from the same source. There is still some truth in this contention; also, the years are not long past when innovation

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*Miles has enumerated public and private school systems, a great variety of governmental, and private educational programs, regional educational associations, government agencies, commercial structures including vendors of educational materials, suppliers of building and equipment, knowledge producing and knowledge applying organizations and mass media, dozens of non-profit structures primarily devoted to educational improvement and change, and a host of special structures, all common in educational organization today.[48]

in education was left mainly to individuals and local school systems.[75] Surely some good ideas have been developed by ingenious educators and will continue to be. Thus, some means of innovation retrieval is needed even though education like farming has long passed the folk knowledge stage. Perhaps the kind of feed-back is more important as guides to needed research and testing than as sources of validated practice.

Another possible source is "experts" peripheral to education which, in this case, may include psychologists, sociologists, political scientists, and the like. Certainly such sources ought to be exploited, one method being conferences such as this one. Lippitt, at the University of Michigan, has formalized this procedure somewhat by arranging periodic conferences with likely contributors from the social sciences.[42] A weakness of these approaches is that potential contributors already have full schedules and thus may not be able to become sufficiently involved to realize their full potential.

A third way is to make innovation somebody's business, with an appropriate supporting organization. This recognizes that there is more to innovation in education than folk practice and the fleeting thoughts of professors including the diligent efforts of a productive few.

Just what the organization of effort should be in the future is probably open to question. Experimentation with a number of structural arrangements as a prelude to formalization may be advisable. In agriculture the resident teaching, research, and extension trio has worked well, but is only one of many alternatives. A number of others have been enumerated by Miles.[48]

The question of whether research and development should be lodged in existing school systems or in some kind of a peripheral one may eventually be resolved in favor of the latter. It is doubtful if schools experimenting on themselves with other major responsibilities assigned would be the best arrangement. Some means of bypassing vested interests, of protecting innovators, and rewarding their efforts, even though sometimes unproductive, are needed. This would be difficult in most school systems. Also, it would appear that objective testing and sustained experimental work may be more possible in autonomous or semi-autonomous systems. In fact, it has been suggested that the most innovations in education have developed in essentially peripheral organizations.[50]

However, external research and development systems pose problems of keeping in touch with the action world of reality and of keeping the research reasonably aligned with the developing needs of educators while reserving some resources for "basic" research. In the absence of effort directed to this end, linkage will likely not occur. Also, organizationally the advantage of associating educational research with resident teaching as a device for the education of teachers should not be overlooked. Undoubtedly this kind of arrangement in agricultural colleges has resulted in more realistic education of change agents on the one hand, and an enhanced competence in researchers on the other.

Another immediate need in research and development is a better means of collecting, analyzing, and collating research findings from an expanding source of supply. A system of indexing and abstracting adapted to IBM card processing now being used by Rogers in diffusion research and similar methods being developed in medical science may be helpful.*

Organizationally, the question of temporary vs. permanent structure may also be posed. There are pros and cons either way. Miles suggests that much energy in permanent organizations is often diverted to routine non-productive efforts in contrast to temporary systems which are alleged to enhance information exchange, hard work, team effort, and compulsive group action.[51]

Even though temporary structures may continue to be used for innovation in education more or less permanent organizations staffed with special research talent will surely be required to generate new ideas and to test them under field condition. Teachers and administrators must have field tested innovations upon which they can rely because costly mistakes must be avoided. There may be a question about the supply of such. Change agents in agriculture generally feel little obligation to argue the validity of the practices after they have been tested thoroughly in experiment stations and would generally have a plentiful supply of practices to recommend. Furthermore, it is very important that changes recommended to rank and file teachers and administrators be of essentially unquestioned merit, the assumption being that their innovative role should be largely confined to promoting carefully validated practices.

2. Disseminating information. After innovations have been developed and evaluated, knowledge about them and their utility must be disseminated to potential users. This constitutes the second functional requirement for implementing change which in turn entails a variety of specialized skills, specially educated functionaries, specialized technical information sources, and organized effort. Even though it may not be generally recognized, there is a specialized technology of implemented change quite aside from other specialized skills in education; this is attested to by the voluminous research and writing on the subject. Studies number well into the thousands and cut across the fields of sociology, psychology, social work, extension education, journalism, economics and political science, along with others.** With the body of knowledge implied by this

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*Rogers at the Department of Communications, College of Communications Arts at Michigan State University, is maintaining a continuing operation of abstracting and indexing diffusion studies from which studies of a particular type or subject matter can be obtained.[69]

**An estimated 5000 studies in one way or another relating to communication or implemented social change was abstracted by the National Project and Agricultural Communications, headquartered at Michigan State University.

research, it necessarily follows that acquiring proficiency as a change agent is in addition to and sometimes quite apart from acquisition of knowledge to be transmitted through the information disseminating system.

Also, a general belief prevails among agricultural college personnel that researchers are ordinarily not good extension people and the converse. In any case, the education accorded each is quite different, both at the graduate and undergraduate level.

Furthermore, the service, supplies, and support that an extension person needs to do his work almost requires that he be a part of a system which makes this possible. Research becomes a matter of direct concern to the degree and manner in which it enhances a better understanding of change processes and conditions.

In education as in agriculture, knowledge is sufficiently specialized to need continuing access to information specialists. The question of where to place them in the organizational framework naturally arises. Because specialists have professional reference group ties which may often be stronger than those to the information disseminating system, provision for a working relationship with their own profession is essential for recruiting and retaining them in change agent roles; also, for maintaining proficiency in their respective professional fields. In agricultural extension systems, the attachment problem is solved by allowing specialists to retain their departmental connections. With local agents in direct communication with people who are targets of change, they provide information feed-back about research needs which are in turn communicated to researchers.

An alternative to information disseminating system interposed between information originator and user as above described, is direct communication between scientist and consumer. Another alternative might be to place researchers and extension educators in a single unit charged with developing, directing, orienting, and evaluating educational efforts which under other circumstances has shown some promise.[22,68] Use of temporary systems for specific purposes offer another possibility but surely would be inadequate.[51]

3. Teaching skills to change agents and potential users. This is a third requirement for getting scientific information and innovations used. For change agents this is accomplished through resident teaching in the agricultural colleges and through continuing in-service education. Target individuals are taught application skills by a variety of extension education methods. This helps dispel fears and forestall failures which is particularly important for early adopters. The documented role of early adopters in communicating information to those who accept later and in convincing them to try new practices stands in evidence of this contention;[59,60] also, the disastrous results of misuse of perfectly good innovations in education.[50]

4. Legitimating innovations and scientific information. Legitimation of new ideas and practices is in some respects a system function and in other respects not, depending on what adopters require for own acceptance. For those who are willing to accept evidence direct from the scientist, legitimation is mainly a system function. For those who require local trial and advice it may be essentially a primary group function. Since several legitimation levels are required with trusted personal referents heavily involved, it is treated under Implications from Diffusion Research, which has contributed materially to knowledge on the subject.

Implications from Diffusion Research for Facilitating Changes in Education

Only superficial reference can be made to substantive findings. These are adequately summarized in other publications.* Whereas the focus of attention has been on organizational implications up to this point, implications from diffusion research relate mainly to the needs of individuals in accepting innovations. In one sense, individual requirements and conditions influencing individual decisions reflect the state of institutionalization of change promoting systems in agriculture, and in another sense, the functional requisites for enhancing adoptions. The procedure will be to briefly enumerate findings from selected substantial areas and to point out relevant implications.

1. The individual adoption process. The much used individual adoption process of awareness, interest, evaluation trial and adoption has greatly facilitated the conceptualization of functions involved in arriving at adoption decisions and in assessing the use of information sources at different stages.**[1,71,72] Mass media of little importance as a major reason for the adoption of farm practices determined by methods used in early diffusion studies[70] proved to be highly important in creating awareness and interest when the newer model was used. "Other farmers" are paramount at the evaluation stage.[14,60]

Perhaps demonstration that adoption is a process and not a unit act is also important. Mundane as this finding may appear, much early diffusion research and educational effort did not recognize this fundamental fact.[70] The process idea emphasizes both time and sequence of influence considerations, while in a sense stages represent functional requisites for arriving at decisions requiring thought and deliberation. The time dimension holds that people ordinarily do not adopt new ideas or practices as a result of a single influence or immediately upon hearing about them. Time is involved in both the sequence of stages that individuals go through in arriving at decisions and in the way in which adoptions aggregate in a given locality. The time span between awareness and adoption may be a matter of years, months, or possibly only days. Also the time required for maximum adoption in a given locality has been found to vary from a few months to 50 years or more.[66,67,9,54,13]

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*Among others, Lionberger (40) and Bohlen (4) have prepared papers on the subject while more complete treatments may be found in books by Rogers (60) and Lionberger (36).

**Limitations of the model, not unknown to the originators, have been ably pointed out by Hassinger (24), Mason (45), Campbell (8). For a description of the model and its implications, see Rogers (60).

To the extent that stages represent functional requisites in arriving at decisions, they are useful in assessing the adequacy of information dissemination systems or partial systems. Thus Miles has used the stage construct to assess the adequacy of various structural arrangements for implementing educational innovations.[41] In regard to individual adoptions, Eicholz and Rogers suggest that the model can be used to classify adopters in terms of likely needs for facilitating the adoption process. Thus, they suggest that rejection for lack of knowledge is an awareness problem and by default or to maintain the status quo an interest problem.[21]

2. Functionaries in the individual adoption process. Individuals like information sources perform different roles in the individual adoption process. Some serve as innovators, some essentially as communicators, and others influentials or legitimators. Those first to adopt a new practice in a given locality (here referred to as innovators) perform a "local trial" function, help adapt innovations to local conditions, and assume risks that others cannot afford or are not willing to take even though they themselves may be relatively secure.[55] Since many farmers want to see a practice tried locally before they use it themselves, innovators play a very important role in influencing and educating others, thus a possible reason why innovators sometimes occur in clusters.[17,50]

Among those sought as sources of farm information, some are in more demand than others; also, still others may be sought for advice. Not all communicators of information are taken seriously or sought for advice; thus the distinction between communicators and legitimators.[41]

A Missouri study showed that the distinctive characteristic of communicators was social accessibility while influentials or legitimators seemed to be most characterized by respect for good judgment and management ability.[41] Both were distinctly more receptive of new ideas from outside of the immediate locality, had more such contacts, and were apparently more able to apply abstract knowledge to own situation than most other farmers. Thus, they provided avenues of ready access for change agents and acted as intermediaries between scientific sources of information and those who used it.

However, in situations where local norms dictate caution in trying the new, innovators may be watched but not followed, with influentials being somewhat less receptive to the new ideas being introduced. In this case, one educational approach might be needed for innovators who are highly receptive to new ideas and one for influentials who may need some convincing.

Certainly there is a need to determine who the special functionaries are in the adoption of educational changes and their characteristics pertinent to the diffusion processes, much as Carlson has done; and incidentally with important parallels in findings from agricultural diffusion research.[9]

3. Legitimation of ideas and information. Legitimation, of which we have already written, may be defined as the process by which fears are dispelled and acceptability of the new is achieved. This is conceptually different from mere acquisition of information.[28,67]

Since there are different adopter clienteles involved in the processes of disseminating scientific information from scientific source to ultimate consumer, legitimation requirements are likely to be different at different levels, e.g., between those required by change agents in agriculture and those imposed by farmers. Even among the latter, requirements are likely to vary for innovators, communicators, legitimators, and the average farmer.[59]

Change agents in agriculture are the products of the same institutions that develop much of the knowledge which they eventually disseminate to farmers. Through the resident teaching activities of these institutions, change agents learn to respect the method by which new ideas and practices are tested in the experiment station and for those responsible for the recommendations. Thus, after graduation, knowledge that new ideas have been tested in an experiment station and are pronounced satisfactory is usually sufficient.

Although a few farmers may accept something directly from the scientific laboratory[26,27] most will require more and indeed a different kind of proof.[38] Even those who serve as legitimators for other farmers, may want to see the innovation build locally before trying it themselves. Thus, local trial by fellow farmers with the requisite experience and reputation for good judgment may be required quite aside from what experimental results show or what agricultural specialists say. Brickel found much the same requirement imposed by teachers in New York state, in accepting innovations also, Barton and Wilder in the acceptance of reading instructional methods.[0,5]

From an action standpoint, these findings suggest the utility of capitalizing on the manner in which legitimation occurs; and from a research standpoint, determination of what the legitimation requirements are for change agents, intermediaries, and direct users of scientific information as well as the characteristics of each pertinent to the diffusion processes.

Teachers like farmers may be reluctent to accept innovations developed under conditions regarded as essentially artificial and thus also require advice and assurance from trusted others as a prerequiste for accepting educational innovations.[44]

4. The adoption curve. Much has been written and said about the S-shaped adoption curve, which is merely a graphic representation of the manner in which adoptions aggregate over time in localities

such as communities, states, or regions.[60,67,54] This curve has been characteristically derived from situations where adoptions have been successful. If failures or near failures had also been considered, the results would have been different. Thus, in a sense, the S-shaped curve is something of an ideal model for change agents but nevertheless one that they can realistically hope to achieve.

Significant features are for adoptions to start slowly, to increase at an increasing rate and finally decline. There is good reason to think that the accelerating pattern results from the interaction of people with people and the way in which they influence each other. Thus, part of the secret of getting quick adoptions is to facilitate these processes. This suggests the desirability of opportunities for teachers and administrators to exchange ideas, and compare notes on innovations which they have tried or expect to try.

Although innovators, communicators, and legitimators are involved throughout the diffusion processes, the intensity and nature of their involvement varies at different stages. Innovators by definition are most involved early in the diffusion processes. Influentials or legitimators are probably mainly responsible for the rapidly facilitating effect after the slow initial start.[60,18] Thus, when influentials and/or legitimators have adopted, others follow in rapid succession, because they are generally more socially accessible and more receptive to new ideas and information from outside sources, they can serve as change facilitators.[38,29,33] In fact, influentials (legitimators) may acquire information for the purpose of communicating it to others as a status enhancing device quite aside from other uses.[46]

The conformation of the adoption curve also has implications for the amount and kind of effort that needs to be exerted at different stages. The first adoptions are achieved only with considerable effort. This is recognized by county extension agents who quite habitually concentrate effort at the early stages of the diffusion process.[71] It is during this stage when new ideas and practices are being legitimated locally, that additional effort to convince local legitimators is warranted. After locally influential persons have adopted the new practices, perhaps the major change promoting problem is diffusing the locally legitimated innovation. Finally when a majority have adopted, reinforcement of decisions may become the main problem. Agricultural change agents have been little concerned with this because acceptance of the new in rapid succession is desired and promoted. Perhaps there is also an assumption that best evidence of continued utility of a practice is results on own farm. This in most cases is highly visible and may be best determined by the person using the practice. In education where results are not so readily visible and result feed-back is much more difficult, reinforcement of adoption decisions may be needed.

In recommending research directed to community adoption patterns, Coughenour has suggested a number of distinctive features; namely, the origin, the slope, average diffusion rate, and the level at which adoptions level off or the equilibrium level. A variety of adoption patterns have emerged in diffusion research findings with some significant patterns if not trends. For example, in education, innovations are sometimes accepted in incredibly short periods of time compared to the past; also, an increasing number of adoption curves seem to show rapid acceleration almost from the start;[9,11,50] thus quite devoid of the slow initial start of those frequently seen in the past. This may suggest legitimation by direct means rather than by associates fortified by local trial or it may indicate rapid acceleration of personal interaction from the start, or the manner in which school systems and administrators are enlisted in the adoption processes as Wayland has suggested.[74,50] In any case it would be particularly appropriate to determine the conditions and means of legitimation which result in these unique patterns; also, other features and conditions which may explain early rapid acceleration.

Diffusion research from a number of traditions suggests the high intensity interaction explanation.[45,66,59,18] On the other hand, Lippitt in Michigan found that some teachers were reluctant to communicate information about own innovative efforts to others, at the same time implying that they thought administrators expected them to be their own innovators and that they consequently would lose status by borrowing ideas from others. Should this prove to be generally true, it would impose serious restrictions on any multiplying effect that personal interaction might have on adoptions.[41] Mort has also voiced a belief that lack of communicative exchange with change agents and peers may be an important factor in retarding adoption of innovations in education.[53] Lippitt also suggests that differential role perceptions of teachers and administrators as to whom should be innovators and for what in education may also be a deterrent; thus the need for role studies.

5. Change agent studies. In one sense, studies relating to change agents and their roles in the information innovation disseminating processes is not applicable to education because such are not an institutionalized part of educational systems. But in another sense they are because whether formally provided or not, intermediaries tend to develop between research sources and target audiences. Several studies show that persons occupying intermediate change agent positions between scientist and the information consuming public must work out effective ways of relating to both.[56,19]

At least one study has shown that those who resolve conflicts deriving from the position in favor of the local clientele are most successful in achieving adoptions but can easily alienate themselves from important people in the central system, and in so doing bring undesirable consequences to themselves.[19] Rogers has shown in Ohio that county agents get their information primarily from agricultural college related sources,[64] while Stone in Michigan study has demonstrated that county extension agents spend most of their time in rendering services to their adopter clienteles.[71]

6. The community. Finally mention should be made of studies which emphasize the importance of community factors, particularly the exercise of power which is likely to condition acceptance of

innovations. Quite aside from what every teacher and administrator knows about this fundamental fact, Mort and Cornell found that community factors were second only to expenditure per pupil as a conditioning factor in influencing the quality and rate at which changes in education were accepted.[54] At the same time, it has been found that changes were more readily accepted in relatively heterogeneous than homogenenous communities.

Certainly for some educational innovations involvement and support of people at the local community level is necessary. Whether the change targets are patrons, teachers, or administrators, involvement of them in the decision and planning processes makes them more receptive to and supportive of the changes being proposed.[12,78]

Also, involvement should be done in the light of the existing power structure of the community as Wayland, Bohlen, and others have stressed.[75,2,3] Both have offered suggestions for doing this while at the same time avoiding such common mistakes as assuming that high influence persons who occupy positions in formal organizations are persons of high power and influence and that they are always opposed to change.

These are a few findings, speculations, and possible implications of diffusion research in agriculture to implemented change in education.

"Reaction to Dr. Lionberger's Presentation"

by Dr. R. M. Worthington*

My congratulations to Professor Lionberger for a very scholarly presentation and also for his development of a specialty in the field of diffusion research. Too few educators can claim a research specialty of any kind, particularly vocational educators. There is such a shortage of competent researchers in Vocational Education throughout the nation that it is extremely doubtful if more than a handful could claim any research specialty.

The purpose of dissemination of research is obviously to put results into practice. The classroom teacher must be the instrument of change. He must put the results of research into practice. The administrator as the authority figure makes change possible. Change agents must be drawn from all levels of Vocational Education. Change must be effected cooperatively.

Dr. Lionberger, it is difficult to compare farm practice to educational practice; however, admittedly there are some parallels. I can recall my own experience, for example, as a youth on the farm 200 miles south of here in the Kentucky burley tobacco country where in 1935, as a farm boy, I raised a one-acre crop of burley tobacco. My yield per acre was 1000 lb. and the price per lb. averaged 12¢. In 1965 the same acre of tobacco would yield 3000 lb. at an average selling price of 70¢.

Research conducted by the Agricultural Extension Service at the University of Kentucky has had a great deal to do with the increased yield per acre. Of course, many other factors are involved in tobacco prices today. I use this as an example to point out that I recognize the outstanding contribution the Agricultural Extension Service has made to agriculture. However, it must be emphasized that in education we deal with human beings--with children--with youth--with adults. We do not deal with the impersonal farm problems such as better hybrid seed corn, more yield per acre or leaner pork bellies. The agriculture researcher has concentrated on benefits to farmers with emphasis on saving labor and money, making profits, and increasing benefits to farmers. Educational research must concern itself with the improvement of instruction! Unfortunately, in education, we have not yet found an effective way to award good teaching.

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We have the experience and the ability in educational circle to do an effective job in research. However, we do not as yet have the administrative structure and the necessary financing to carry it out effectively.

I agree with Professor Lionberger that we need to develop a diffusion system and I would put it this way: we need a diffusion system and a set of legitimation devices particular to the needs of Vocational-Technical Education. No doubt the Ohio State University Vocational Research Center and the 24 state research coordinating units are a start in this direction. Not only can these research coordinating units be innovators but also legitimators. Professor Lionberger's study of farmers in Northeast Missouri concerning diffusion of information in rural communities concluded that information "flows downhill in terms of prestige; the seekers seek information from those who have higher prestige ratings than either the seekers or the community average." As long as school systems recognize different prestige roles between teachers, supervisors, principals, and other administrators parallel conclusions might be observed in flow of information throughout school systems.

Prior to the passage of the Vocational Education Act of 1963, and the Elementary and Secondary Act of 1965, it was reported at a national research conference that 95% of the research funds made available through the United States Office of Education went to 10 major universities. Very little of this research filtered down to the practitioner. Because practitioners have not participated in research generally their image of research has not been good. It has been looked upon as a "mysterious" activity and something beyond the capabilities of a classroom teacher or school administrator. Speaking of the image of Vocational Education, I might also interject the fact the only three states in the nation, at the present time, employ persons in their State Divisions of Vocational Education with full-time responsibility for public information.

According to George C. Homan, "Research done in the last 20 years in the area of communications structure and influence flow has resulted in discarding the concepts of mass media and mass impact. The problems of civilization are the problems of the small group. Information is stepped down through groups leaders for attention, consumption and use by individuals in groups."

Neal E. Miller, in the NEA Publication on Graphic Communications, pointed out that in dissemination of research findings there must be established an "Innovator - Adopter Context." In this respect he stated that Miller's "Drive, Cue, Response, Reward Paradigm" has implications for research diffusion.

1. Drive: Adopter must want something.
2. Cue: Adopter must notice something.
3. Response: Adopter must do something.
4. Reward: Adopter must get something he wants.

Kurt Lewin, in the Journal of Social Issues, suggested that in order to get people to change we must move them through three behavioral steps, which he refers to as:

1. Unfreeze: Change to improve or avoid worse condition.
   Create dissatisfaction.
2. Move: Inducement or reward.
3. Refreeze: Equilibrium set at new behavioral level.

Art Gallaher, Jr., of the University of Kentucky and also Egon Guba and David Clark of Ohio State University, have suggested that education might very well adapt the methods of the Agricultural Extension Service.

Gallaher recommends the creation of an education extension service with functions of innovation, dissemination and integration. He asserts that the problems of educational change do not rest mainly with the administrator who is more often called upon to play the balancing role between school board, parents, teachers, students, and other administrators--than to provide the leadership for change!. This recommendation makes a lot of sense to me because the administrator must make it possible for the teacher to implement change!

The teacher is the key to all our effort! Teachers of Vocational Education make or break the program! They must be involved in research if research is to change practice. I agree with Dr. Lionberger that "Teachers may be reluctant to accept innovations regarded by them as artificial if they did not have a part in the innovating."

NEA's Association for Curriculum Development says that the action research idea has so much to commend it that we should strive for the time when a part of each teacher's day would be set aside for it as a part of their scheduled responsibility. Others particularly "University type" researchers have taken a dim view of action research--calling it "nothing more than qualified common sense rather than research." Action research is based on concrete practical problems in a real school situation.

It seems to me that one of the best ways to disseminate research results is through action research. Action research has been defined by Stephen Corey as "research undertaken by practitioners to improve their practices." By getting practitioners involved in research, evidence can be accumulated to define problems more sharply. The researcher can draw on experience available for action hypothesis enabling them to cope with day-to-day problems. Action research can test out promising procedures on-the-job and accumulate evidence immediately of their effectiveness. In action research factors being researched are studied as a part of the day-to-day activities and problems of the teacher. Action research studies problems and tests innovations in the classroom with the primary goal of improvement of instruction. Outcomes of action research are based on behavioral changes that occur in the teacher-researcher themselves. Practice does not change unless the teacher himself changes.

"Reaction to Dr. Lionberger's Presentation"

by Dr. Alan G. Robertson*

I think we have to differentiate in terms of diffusion--that which is content in vocational education and that which is methodology. I don't think we can use the same practices and the same methods to diffuse change in content in our areas of vocational education as we can in methodology. I think methodology is a lot more difficult. I don't think we can depend upon the illustrations of industrial practices or farming practices or new concepts in women's occupations to illustrate that content change is necessary and up-to-date. We can possibly show it by the changing job market.

With regard to classroom methods and techniques or the use of equipment, you always come across the vocational education teacher who says, and perhaps correctly, that kids are kids and no matter what you do with them they're the same, and, therefore, you may bend the methodology a bit but you teach the same. I think that in terms of diffusing new ideas in education we have a real problem in new techniques and methods.

In terms of adopting new ideas in an agricultural frame of reference, we are using cost analysis practices, primarily whether there is short-term gain or long-term gain and it's sometimes pretty difficult to determine. Sometimes you have to do a follow-up study twenty years later to determine the effectiveness and value of an educational change and the acceptance of that change. We don't have that immediate return of results upon which we can evaluate new practices. In regard to any suggestion that maybe we should take research and development in vocational education and by-pass the school system--by-passing the vested interest, by-pass this resistance to change. I don't think we can do it. If we try out new methods, try to adapt new techniques in a laboratory sense in a laboratory situation in a peripheral organization, whether its foundation or an equipment supplies facilities--as soon as you try to put that back into the school situation you're dealing with the problem suggested by Dr. Worthington where people will say this is an artificial situation--"I wasn't involved; it doesn't fit my local set of situations." You can't by-pass the local situations even though it may be negative; instead, you have to anticipate it and account for it. Therefore, I think we have to deal with the negative factors in change as much as we do with the positive factors. In other words, let's identify the barriers; let's identify the blocks. If we anticipate them, they won't trouble us quite as much when we come up against them in the diffusion of information. One of the blocks that I see is that we are dealing with a great multiplicity of potential change agents, whether they're the legitimizers, the communicators, the adapters, people on the local level. Let's see if we can enumerate some of them and I think this enumeration will illustrate why our problem is so different.

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First of all, we have to reach the general public and get their acceptance of educational change. We have school-connected public, school-connected business, government organizations, branches of the legislature, the executive in terms of the governor's budget, the judicial in terms of cour decisions on things that we have been trying to do in education. We have local boards of education, county boards of education, state boards of education--all of which may have different ideas. We have manufacturers of school products, related practitioners, and professionals who have to be convinced, like lawyers, school public health officials, school architects, and you know what a problem that is in terms of new facilities, design and layout. We have all kinds of educational researchers that we have to see on change, too, both in the educational framework and in the social science framework. You deal with the professionals in education and here there are a whole gamut of different types--school teachers, school psychologists, pupil services, administrators, subject-matter supervisors, superintendents, college administrators, professors of education versus professors of content, and these two don't match very well sometimes, state education department and finally on top of the list we have the U. S. Office of Education. In trying to deal with all of these change agents in the complexity of public education, I think we have our work cut out for us. And, of course, the most important group, one not listed above, is the learners. We have the youth of different types as identified in Public Law 88-210: youth with special needs--again of many different kinds as we have recognized in our various states and, so, we have these potential barriers and this problem of trying to shift our approach in order to reach the right change receptor with the right change technique and instill the right attitudes. Some of those negative factors present are:

1. How pertinent is the information to me, that's one barrier.
2. How authentic is this information which is being diffused?
3. Who is the diffuser, a professor or a state education department bureaucrat?
4. What is the authority relationship of the diffuser? Is he my local principal--an "I do it because I have to" relationship? Is it a blanket order going out from the superintendent's office of a large city that all-day classes in trade and machine shop have to include these units and these practices?

5. Is this research information coming down to me isolated by itself or am I getting several different slants all pointed toward the same over-all goal; in other words, research information which converges from different sources and points up the same results very often has more status than something which is isolated by itself. It's been said that research information just as research information is a pretty weak "shaper of educational practices."

More utilization barriers, barriers that operate at all the above levels and with all the types of people, include the following:

1. What is the norm, what is the status quo?
2. What is going to try to counteract any change--the idea that for every action one way there is a reaction the other way--how do we identify this?
3. The overload barrier, the pressure on people to do too many things, so therefore the change is put in the bottom drawer or maybe worked on only after school.
4. What is the stress involved in the change? Is it a happy type change or is it something that upsets people?
5. Do I expect the costs of this change are going to outweigh the rewards? This can be a negative factor.
6. Are there rewards not connected with the change--such as financial gain, loss of power or prestige? Is there any conflict of interest on the local or any of the levels?
7. How does all this tie in with a research coordination staff operation?

I think we have to look at some different tacks in terms of dissemination. We have to develop techniques in funding proposals with state 4A money. Maybe we ought to build into our budget something like a "field tester" when we are funding a local innovation. Let's not cut it off with 225 copies of a written report into the state education department before we make the final payment. Instead, let's build in maybe a month's travel time and a substitute teacher's time for the change innovator to first go on the road to other school systems to observe, talk, discuss, and to invite others back to see the change. I think we would get a lot more mileage out of our local 4A projects if we did a little more dissemination that wasn't written.

In terms of the future, all the Research Coordination Units ought to concentrate on being quality control people--people who aren't hampered by federal report data in terms of their own operation, that have to get in by the first of July, that as quality control people we develop ways and means to deal with resistance to change and resistance to evaluation and that most important, we start training people in the field for research utilization. This in the long run may be our most important function.

DISSEMINATION OF RESEARCH AND DEVELOPMENT INFORMATION

by Harold Haswell*

ERIC - The Program of The Educational Research Information Center
U. S. Department of Health, Education and Welfare
Office of Education, Bureau of Research

ERIC's purpose is to make available to the educational community the valuable research and related material which might otherwise remain unknown to it.

I. ERIC - The General Need of the Education

As in the science world, it is necessary that the educator have access to the work of others in his field. He cannot afford to isolate himself or his work from that being done by his colleagues all over the country.

II. And the special need of the Office of Education

In addition to this general need, the Office of Education itself needs ERIC to help manage the great number of research projects the office itself supports. Since 1956 when the cooperative research act was passed, the Office of Education outlay for research has increased from $1 million to $100 million.

III. The two ERIC's

1. ERIC Central, which coordinates the national system.

2. The ERIC system of decentralized research clearinghouses. This means that, unlike most information dissemination systems, not all education research documents or specialists will be housed under one roof. The documents and specialists are left where they are.

Established collections of educational material are not disrupted; instead, they are built upon. Each clearinghouse specializes on a single research topic and seeks out the literature in the area of its specialty. Clearinghouse specialists identify, acquire, and select materials to be forwarded to ERIC Central.

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Note: This presentation focused upon a number of overhead visuals--hence the outline form has been used to show the primary content of the visuals.

Accepted documents are abstracted into 250 words and indexed. Those forwarded to ERIC Central are reviewed there, and if satisfactory, go into the national distribution network.

Documents are indexed by a system developed by ERIC Central--an important by-product of this system will be a thesaurus containing several thousand education terms.

The abstract and indexing are combined on a resume form. This becomes the basic description of the document and is copied on microfiche. Microfiche is a 4 x 6 inch sheet of film carrying five rows of 12 images for use in inexpensive microfich readers. The 50 pages of document No. ED001631, for example, is reporduced on one microfiche.

Documents are now retrieved by use of coincidence cards. A search for material on "curriculum" will produce a large number of documents. Superimposing qualifications--"curriculum in poverty area junior high schools in New York State," for example--will produce fewer more specific papers. As the system grows, a computer will be used.

Stored documents are announced in bulletins. Author, title, location of study, length, and a resume are listed. Requests are filled by reproduction on microfiche at a few cents a copy. Hard copies cost a little more.

IV. ERIC's Initial Effort

To supply documents on educating disadvantaged children. Nearly 1,800 documents were selected and disseminated. Four packets of material were mailed to 650 state and local education departments. These packets totaled:

1,750,000	resume forms
2,400	program descriptions
560,000	microfiche, representing nearly 30 million printed pages

Now the task of ERIC is to develop the decentralized information system, coordinating input from clearinghouses with needs of users.

V. ERIC's Ultimate Goal

A network that will link universities, professional organizations, school systems, boards of education--the entire educational community--to speed all research results to places where they are needed and when they are needed.

APPLICATIONS OF PERT TO EDUCATION

by Desmond L. Cook*

The title of this address is "Applications of PERT to Education." Perhaps it would be better to ask the question: Can or should the management information system known as PERT be applied to educational activities particularly research and development projects? An answer to this question lies in understanding three things. First, the purpose and nature of management. Second, the context within which PERT developed. Third, the similarity of the educational to the non-educational enterprise where PERT is used. I would like to discuss briefly each of these points, make on or two general comments on reasons for applying PERT to education, and then give you some of my thoughts for the future.

Management Process. The management process can be broken down into four or five steps depending on how you want to consolidate terms. The first of these is establishing the end objective of a particular project or program. The more clearly we identify the goal to be reached, the more likely is the project to be successful. After the final objective is identified, then we must plan and outline the work to be done to reach the goal. For any particular project, there are many plans one can follow to reach the goal. Eventually, one plan is established to start. After the plan is established the process of scheduling is begun. Scheduling permits us to begin organizing personnel, materials, and related items to accomplish the plan.

As the project moves along, progress is measured to note deviations from the plan. The project may be behind, ahead, or on schedule. Hopefully we will at least be on schedule. In those cases where the project is behind schedule, then some replanning must be done. The replanning process not only involves changing the plan but it also might cause us to establish new objectives or even to modify the original objectives.

To summarize the process of management, I would stress the two tasks of planning and controlling. Planning is outlining the work while controlling is noting deviation from the plan and making necessary corrections.

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If one examines many educational research and development activities, he will note that the several management steps are involved in the conducting of the work. The project director, therefore, becomes in effect a manager who makes decisions centering around the most optimal use of time and resources to achieve the projective objective.

PERT Development. Now let us look at the reasons for the development of PERT. The traditional and existing management systems appear to have not been adequate to do the job of planning and controlling in a new area--that of research and development. If the concern is with production or routine activities, the present systems prove quite adequate. But when we move into new areas such as those represented by high state-of-the-art involved in the research and development areas, there appears to be a need for a different system. Further, the magnitude of many military research and development projects put a tremendous stress on the coordination of the work of many subcontractors. These two conditions of inadequacy of traditional management systems and the magnitude of the research and development projects led primarily to the development of PERT. A secondary condition which facilitated PERT's development was the availability of high speed computers. If such equipment to provide information quickly and rapidly as demanded had not been available PERT might not have been so successful as it turned out to be.

Educational Research and Development Characteristics. Let us move now to the similarities between educational and noneducational research and development situations. First, let's look briefly at the characteristics of research and development projects and ask the question: Does the characteristic fit the industrial and military situation and does it also fit the educational situation?

The first characteristic of research and development projects is the fact that the end products are either single or few in number. It may be that we are producing a new curriculum which may consist of a teacher's guide and a student textbook. We have now two end items making up a total project. We may have on the other hand one product, such as the development of a new student registration system. Just as we had the development of a Polaris submarine system as a product, we also have the development of a registration system as a product.

A second characteristic is that to accomplish these end items, end products, or end objectives, the work to be done has to be ordered in terms of its sequence and dependency. One has to identify the many kinds of activities involved in establishing a new registration procedure or developing a new curriculum and determine their sequence and dependency.

A third characteristic is the degree of uncertainty existing as to both the nature of the activities we are going to undertake and the time involved to do them. This is true not only in the development of such items as rockets, missles, and even space shots but also it is true in the case of trying to develop both an achievement test which will have validity for a new curriculum and the evaluation of that particular curriculum.

Fourth, most research and development projects can be characterized as being "once-through" activities. The project is done only once. Once it is done, the chances are that nobody else will do it again. This condition has raised, by the way, an interesting question with regard to evaluating applications of PERT to projects. Someone has suggested that the way to conduct such an evaluation would be to come out with a statistical test of significant differences (by comparing one or some criteria) between a research and development project using PERT and one not using PERT. If one keeps in mind the concept of "once-through" plus the nature of research and development, how can you have two identical projects unless you purposely want to fund two for this purpose? Hence, the evaluation of PERT as a technique is going to be for some time somewhat on a subjective or non-statistical test basis.

Fifth, research and development projects require the coordination of many persons and agencies. I would just have you think of all the people who have been involved in preparing and conducting this workshop. The staff had to arrange for the physical facilities, speakers, assemble teaching aids, contact the publicity office, and many other activities. You can just imagine what it would be when dealing with a project such as Apollo or Polaris. One problem is to have some systematic way of communicating to the several agencies, the staff, and the other people what the project is all about, the flow of the work, the nature of the work, etc.

Looking at these five characteristics very quickly, one can apply them to a project like Polaris and then go from there and apply them to educational research and development. I think you will find they fit both situations. In my thinking about PERT's possible application to education, I start with the assumption that the characteristics of educational research and development projects are basically the same as the characteristics of research and development projects in government and industry.

Current Situation. Now let me comment briefly upon what I believe to be some current courses or factors operating in education which cause us to look at management information systems as a way of helping us do a better job in the research and development effort.

I think we are now entering a phase that industry and government entered years ago; that is, finding a new way to manage the research and development enterprise when traditional methods might no longer work. Both the government and industry were forced to pay attention to this problem. So must we! I don't think we have yet been forced to face this issue. I do believe that we are going to have to face it whether we want to or not. Why do I say this? Primarily because we are now receiving research support on a scale or a magnitude that most of us probably never dreamed would exist in the field of education. The Cooperative Research Program started in 1956 followed by the NDEA in 1958, the Vocational and Technical Education Act in 1963, and the Elementary and Secondary School Act in 1965.

Look at all the programs we now have! Look at all of the money we now have available to us! I don't think we have yet the experience or the know-how to really manage this tremendous amount of money. We're going to have to look at management systems to see if they can't help us do a better job. Our effort with PERT is really just a little one compared to what I think will become a total field before long.

I would advance as another reason why we have to face up to this problem is that our research and development projects are becoming more and more complex. You have now project teams with up to twenty-five people. They are all doing many kinds of things and may even be in different parts of the country. One project, for example, involves not only Ohio State University but also The University of Illinois and Cincinnati Public Schools. So you know that there is a tremendously large group of people on this project. We are now going after our problem more and more with a team approach. This condition forces the project director to become a manager as well as a doer of research. The fact is that he may do very little research. All he does is hire and fire and answer questions and make decisions, and all those aspects which come with the managerial position. You may say, "Well, you could turn these over to his assistant," but when you have the responsibilities that come with the spending of funds, you want to take a hand in what you are doing.

Another reason that I believe we have to look at the problem of research and development management in the field of education is that we are going through a time when innovation and change are being scheduled. We just can't wait any longer in many areas for things to come about by a process of osmosis or gradual transition. We are now deliberately sitting down and saying to ourselves in many areas of the educational world, "Now look, we want a new curriculum a year from now in this field. Let's get at it. Let's start developing it." Or the school board may say, "Starting September 1, 1966, we are going to implement SMSG, let us get organized to do so." These are the kinds of things we are now doing. The Board of Regents in Ohio plans to open a Cleveland State University within a year or two. Here is something brand new. What are all the steps involved? How do you handle it? These are the kinds of things I feel we are now faced with in this areas of innovation and change.

I think except for what might be called the profit motive, our concerns are very much like industry's. We want a kind of economic efficiency. What is the most efficient or wise use of a faculty member's time on the project? To what should he pay attention and what should he not? We don't want him to spend all of his life on the project nor all of his waking hours on the project. We want good planning on educational projects. We want them to be more realistic in terms of the time and resources needed, and more carefully explicated in the terms of the operational steps that one will have to go through. In this way, we can better evaluate and fund those projects which perhaps seem most economically efficient in all aspects.

I think we are also faced the same as industry is with the problem of decision making. There is a great emphasis on decision theory as some of you may know, but we are getting closer and closer to the problem. With many alternatives being available to us, which one are we going to decide upon? What is the best choice with regard to time and cost? These decisions keep occurring throughout the duration of the project. All you have to do is manager or direct one for a while and you will soon find out that time-cost trade-offs occur frequently. In summary, I am suggesting we don't have the experience yet in the management area to do adequately the job of managing the tremendous amount of money given to us in research and development efforts and we are obliged to do something about it.

Educational Applications. Turning quickly to some current PERT applications in education, I would like to start by raising a question. When or under what conditions should I implement PERT on my project? If you meet three conditions, then you probably have a project on which PERT could be applied. First, is there a schedule to be met? Has somebody given a date by which something must be done? Second, is the project relatively complex? Does it involve many types of jobs, many types of persons, many types of activities or is it a simple linear three or four activity task in its basic conceptualization? Third, how much uncertainty exists within the nature of the tasks and the timetable? If one can answer "yes" to these three questions, I would say that you have a situation to which you could apply PERT. In almost all cases, this covers the research and development projects being funded by various kinds of agencies.

We have encountered many applications to education. Let me present two or three. One is an application of PERT to the development of Cuyahoga Community College, a junior college in the Cleveland area, by Dr. Ellis Benson. Dean Benson has a staff that meets weekly. Their activity and direction is determined by the PERT output which they obtain almost weekly. With what kind of a task are they faced? This two-year community college started with about 6,000 students. Within another year they expect an enrollment of 14,000 students. They also have the land in an urban renewal area on which to build new buildings. They have to coordinate the building, the staff, the curriculum, and all other activities. We have also found that the Shoreline Public School District of Seattle, Washington, is using PERT in three situations. First, it is being used in the planning and establishing of a junior college. Second, it is being used in the development of a basic curriculum guide at the elementary and secondary level. Third, it is being used in the installation of IBM 260 series for this school district. Michigan State University has used a PERT network flow chart to move the library from an old building into a new one. We actually have a chart in our office for this move.

It doesn't take one too long to really think of the many kinds of educational problems to which PERT can be applied. For example, The Ohio State University is going to a GE 636 computer within a year or two. What are the steps to be involved in making the transition from our present IBM 7094 system? I think PERT could be used on this. We are also developing plans to schedule students by computer. I think PERT could be used on the development of this project.

I would not be doing my job if I put any restrictions on the types of projects to which PERT could be applied. I think we have yet to find out. I don't think we have looked at this problem long enough in the field of education to say that PERT could be applied here and can't be applied there. I think it's still an open question.

I would also be amiss in my duty if I failed to point out that everybody is not as enthusiastic about PERT as I am. Many of my colleagues say that such applications are a bunch of nonsense. They state that once you begin to plan and control through such techniques, you begin to impinge a little bit on their academic freedom. You begin to force them into a kind of channel in which they don't want to go. It doesn't provide them with the opportunity to follow-up the opportunities they would like. We have also encountered a kind of resistance which I don't know how to describe adequately except to note that when you get people PERTing and they have to define activities in order to set up activity times, they are now forced to define the activity and many times they cannot do so. Such a situation becomes a little bit embarrassing to them.

Another prime objection is that PERT is fine for development projects and applied research but it just won't do for basic research. I would ask such persons to read an article from Harvard Business Review called "Fundamental Research Can be Planned."[1] The writer was using network theory in answering this objection by the insertion of decision points. In any kind of basic research, such a procedure would be involved. It is simply a matter of replanning after certain decision points are reached.

A management information system like PERT does not plan or control in and of itself. It only helps us to do these two jobs better. One of the observations the PERT staff has made in working with people on education projects, and talking with people around the country, is that when you mention the words planning and controlling, they begin to feel that the PERT technique is going to tell them what to do; that it will plan for them and it will control them. This is just not the case! The person who wants to use PERT is the person who makes out the plan. PERT doesn't set the plan for him. He will also do his own controlling. PERT will only give him certain types of information that management specialists think are needed in order to help make sound decisions and actions as the project moves along toward the end objectives.

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[1] Robert M. Cavanaugh and James B. Quinn, "Fundamental Research Can be Planned," Harvard Business Review, January-February, 1964, pp. 111-124.

Future Concerns. What about some forecasts and implications for the future? What do I see? I think you will find PERT applied increasingly both in the planning and controlling not only of educational research and development but also in other educational activities. Once administrators can begin to see the value of the technique they might want to teach their students about it as a way of getting project objectives accomplished. When we begin to get this kind of emphasis, this kind of interest, I think we will then begin to get this kind of usage of PERT which we need to study its value. People keep asking us, "Because you are studying PERT under funds from the Office of Education, are they going to make us PERT?" I cannot answer that question, but it is an interesting one as to whether or not it might help in the long run in securing better project management.

I think in the future we are not only going to have to have students who study research methods but who will also study the management of research and development. Research is getting too large to leave its administration to chance. We might well turn out at the doctor level research administrators and managers who are trained to handle the trmendous amount of money that we are going to receive for large team operations.

I think another condition here which is important to look at is that if we fail to produce results under the varied and numerous government programs because we don't know how to manage, to direct, or to administer projects then I think we are going to be hurting five or ten years from now. People will begin to evaluate us and our capabilities. They might say, "We gave you all that money and you appeared to use it unwisely and, therefore, if you can't handle it, why give it to you?" I think we are sort of obligated here to prove to people that we can handle the public's money efficiently.

Conclusion. A significant opportunity lies ahead of us to handle the increased research and development effort in a new way. Let us give attention to associated management problems in all their dimensions. Let us utilize PERT not from the traditional approach which generally imitates a new and respected technology coming in by a process of osmosis, but by a direct and immediate application to the field of education.

[A basic annotated PERT bibliography is included in the Appendix.]

RESEARCH COORDINATION--WHAT LIES AHEAD

by David L. Bushnell*

In its year and a half of activities, the Division of Adult and Vocational Research has had over 600 proposals reviewed and funded approximately one-third of these proposals. A good deal of our success, I think, is due to your (Research Coordinating Unit personnel) functioning and your assumption of responsibilities last June. We've been weighing very carefully the goals and scope of operation of the Research Coordinating Units. Through several discussions with our advisory committees, Dr. John Bean and I have tried to identify what we think to be some of the major activities, the kinds of thrusts that you should be getting into in your state programs. Let me just go through and provide a checklist of items that you may want to consider as appropriate, and here I shall lean heavily upon the original purposes and objectives laid down in our call for proposals last May. We listed some eight areas. What I plan to do is go through this list and pinpoint some of the activities that appear most relevant for the states to be involved in. In many cases these are projects or activities already underway. The first area and a very important one, of course, is:

I. To stimulate and encourage occupational research activities.

Without your communicating with relevant research groups in the state--the needs, the priorities, the objectives of our research program will not likely get the response they should. This means that we want to keep you advised on what research we have and you ought to keep us advised on your problems and interests and together we can work out a set of objectives, assuring the best utilization of the funds available. I think this also suggests that you will want to keep abreast of the literature in the field as best that you can. Think you will also want to keep up on new legislation being passed by Congress. Some of you may not know that in the Elementary and Secondary School Act, under Title V, there are monies available for summer institutes, summer regional institutes, that there are monies available under P.L. 480 for studies abroad, matching funds available in foreign countries for study abroad. That under the OEO program, you can have access to basic adult literacy training--a fund to help set up and implement basic adult literacy programs within the state.

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*Director, Division of Adult and Vocational Research, U. S. Office of Education.

Note: This is not the complete text of Mr. Bushnell's presentation. A brief initial portion focused upon a set of visuals presenting a review of research funding activities by the Division of Adult and Vocational Research.

In addition, the National Defense Education Act has provisions for summer institutes as well. There are a whole host of legislative enactments which you ought to be attentive to so that you can advise personnel in your state how to go about getting such funds. This suggests that you also know where to go for such funding. I recognize that there is a maze in Washington and you may have to spend some of your time actually coming there, walking the streets and corridors trying to find out who are the right people to see. We will try as best we can to communicate to you any changes that take place in organizational structure.

II. The second major responsibility of the Research Coordinating Units is: To coordinate research inside and outside the state.

By that, I mean to circulate listings of on-going research projects which we provide and which you yourself may want to provide within the state. As a part of your activities, it would be useful to keep a listing of consultants within and outside the state who would be helpful to those wanting to conduct research studies, particularly at the local school district level. There they need to turn to someone to get the names of competent people who can be of help as consultants in structuring research or advising on on-going research. In regard to this function, it may be advisable to conduct periodic conferences. In Phoenix there was a regional conference by several states who came together to talk about state-wide planning for implementing state research coordinating units and the use of vocational education research funds.

III. To disseminate research information and findings as they become available.

We feel that it is of great importance to establish information centers on the great deal of materials--textbooks, films, tapes, video-tapes, other instructional materials you ought to have there for use by the local school districts.

IV. To review monetary and perhaps fundings research projects within your states.

Here we are completely dependent on you for your assistance. We do not have sufficient staff within the Office of Education to meet the demands for the many consultative services or draft proposals that come in. We have, we hope, been turning these people's attention to the RCU's in their state, asking for their assistance and thereby assuring a better quality of proposal before it comes to the Office of Education. We think this is a much more relevant and efficient way of handling draft proposals. We think too that there ought to be sources of funds within the state for research activities to meet state needs. Here of course we have 4A funds under the Vocational

Education Act as well as funds becoming available under Titles I, III, and V of the Elementary and Secondary School Acts. These funds could and should be spent in resolving problems unique to your state efforts. They might also be used to support pilot programs, planning projects, demonstration projects, etc., that could be built into a larger study; a larger proposal to be submitted for federal support. This suggests that you may want to take some time in thinking about your own set of priorities hopefully gearing them to the priorities we have established at the federal level.

V. To encourage and support pre-service and in-service training for research personnel in the state.

There is going to be and is now a definite shortage of qualified personnel. We think that the RCU's could be very helpful in supporting and identifying and in helping to locate competent research talent within the state.

There are Title IV monies under the Elementary and Secondary School Act for the purpose of training research personnel. We think that you people might very well work with your universities, and even yourself, in submitting a proposal for the conduct of new research training efforts. These proposals should be submitted to the Office of Education for funding. There is approximately 8 million dollars set aside for the training of research personnel at the post-graduate and under-graduate levels.

VI. Another interest you might have is that of maintaining an active list of graduate students and post-graduate students in the research field.

There are many universities trying to find such people. We, ourselves, would like very much to tap talented young people coming out of our universities and training programs.

Identifying and maintaining inventories of available occupational research and development resources--who in your state is capable of conducting good professional research in support of the vocational education field? You may want to conduct or contract for your own survey of your state resources for research.

VII. Another function, and one that we think is extremely important, and one that began receiving a great deal of attention because of the Research Coordinating Units now in existence is that of planning. A good deal of effort has been made to survey available data on employment opportunities, to identify the emerging occupational trends within the state and local regions, to work closely with the Bureaus of Employment Securities in your state departments and to assist in the translation of this available information into skill requirements and appropriate training programs.

We made a study, a non-random sample, of six state RCU's: Illinois, Michigan, Nebraska, Kentucky, New York, and Iowa, and asked them to what extent they were able to coordinate with and cooperate with their state departments of employment security? All replies indicated that there was interest in developing a more unified cooperative program of job information and there were varying degrees of progress. I can't lend enough support to these kinds of coordinating activities to implement the kind of training needed for our emerging technology. I'm not necessarily suggesting that the RCU's become full-time research unemployment agencies--it should be your goal as catalyst in getting the right groups together, making sure the planning is carried out. That the information now available at either the federal level or that available through the Bureau of Labor Statistics or elsewhere is translated into terms that can be used by vocational educators in planning their local programs.

VIII. I think that you have a responsibility in helping your state directors develop the state plan for vocational education.

You should be involved in assessing the adequacy of facilities, teacher training programs, recruitment, availability of new and traditional training (as against the demand for such training). This ought to be your role as a chief planning agency for the state department of vocational education. We think too that in this role of planning that you ought to be able to relate the vocational education needs and interests to the broader state educational program.

What role should occupational education be playing in preparing the disadvantaged youth for not only a vocation, but for their role as adult citizens? I think it's time that you begin vocational education in general, begin taking the initiative of preparing youth for successful careers as adults in sub-professional occupation.

IX. Moving on to the next major area of emphasis, I want you to keep abreast of the kinds of funding the federal government is making available so that you will take the initiative at the state department of education level in seeing to it that these funds are put to good use. With vastly increased state aid, with the rising prestige of vocational and technical education, with the ties that vocational education has had traditionally with industry, and with the snowballing support of community colleges and area vocational schools, we think there is going to be a definite coordinating function that the RCU's could play at the state level. If you are doing this job properly, you will be look ahead five or six years; you will be aware of the increasing demand for college attendance; and as students will not be able to get into a college of their choice, technical institutes, or any college for that matter, they're going to fall back on their community colleges. This rise in demand will certainly benefit and should be planned for in implementing proper vocational and technical education programs.

What are we planning to do at the federal level in support of Research Coordinating Units? I must say that it's been an exciting year, things have happened that we hadn't even dreamed would happen, and many of you have shown tremendous initiative in seeing that these changes were brought about. States like Connecticut and Oregon have been very impressive in their finding of better occupational training to meet the kinds of needs that exist within their states; the effort Illinois has made in soliciting and supporting research on its own. In the states of Washington and New York, the RCU's fit within the state department research program as a whole and as a result they have made considerable headway in allocating funds, bringing about a better means of studying needs in vocational education.

We recognize that a few of you who have had staffing difficulties and we're impressed--in spite of that problem--by the speed of development and scope of your operation. I honestly believe that the funds invested in the RCU's will have a greater impact on vocational education in the long run than a comparable amount spent to finance civic projectx. There is no question whatsoever as to the value or desirability for continuing our RCU's--the only question is one of finance. In the long run, it is our view that the necessary expense of interstate or intra-state research coordination should be borne by the individual states--I think that was made clear in the establishment of this program that in the long run we hoped to be able to phase out federal support and see these state units become entirely self-sufficient. However, in the short-run it is probably unrealistic to expect that adequate state commitments could be made in time to insure the continuing functioning of all the RCU operations. There are several reasons for this--we know that state departments and universities have already planned their 1967 activities and budgets, and that the level of activity in the RCU is such that they cannot expect to find sufficient state funds to carry those programs out. We know that in some states the ancillary 4a aid funds would be a logical resource to turn to, but they're, in many cases, not adequate to meet the demands. In North Dakota, for example, a commitment of the total 4a funds would cover only one-third of their RCU costs; thus time must be allowed for finding other sources of support. We know, too, that legislation will be required in many states if substantial expenditures are to be made for vocational research. Most of these state legislatures meet on a bi-annual basis and, therefore, could not possibly get together before 1967. In light of these facts, I am recommending to the Office of Education that they authorize and negotiate amendments to the existing RCU contracts to continue their operation for an additional 18 months, beyond next November. Beyond that, however, we hope that there will be a phasing-out of our support and that there will be evidence of a continuing take-over of these units by the states. There are a couple of conditions that we've built into this possibility of re-funding and additional funding.

The first is that we are going to escalate the matching fund requirement from 10%, which we began with, to 15% as a minimum, realizing that many states can go well beyond that level. We're also interested in seeing that those states which have not received RCU's get some consideration. For that purpose, we have decided to ask all states interested in submitting proposals to do so on or before June 15th. Then we will have a chance to review those and pick the best from among them. It does not mean that we will fund all proposals submitted. We are ear-marking about 2 million dollars of our 1967 fiscal year funds in support of RCU's. This means that on the average, we can only support 20 additional units. We may also, and I want to make this quite clear, decide to discontinue support of some already existing RCU's where they have not been able to fulfill their obligations. If there is evidence that they are not succeeding, there is no reason we should go on supporting them; instead, we should probably take this money and make it available to a state which now has or wants to establish an RCU program. We think we can see our way clear to continue support of most of the RCU's that are now in existence beyond November for an additional 18 months. We are asking that there be a minimum of matching 15% funds available and that some of the larger more affluent states go well beyond that minimal level. We are going to entertain additional proposals before June 15th and out of those we will select additional units to support.

I would like to close by emphasizing what I think to be one of the most important missions in vocational education, as well as in general education today; a mission in which you can be a very great help in implementing. I think it is important to recast some of our basic attitudes toward vocational education and general education. We should not see it as an obstacle course which is deliberately designed to eliminate a certain percentage of the participants in this course. Hopefully, it's rather a way to enrich the lives of all those who undertake to improve themselves in the game of education. There should be no losers--only winners. To achieve this kind of goal in our public education system, we have to gear our program in the largest percent possible to the individual needs of students and ways must be found to provide each student with the basic and occupational education at the time he will benefit from it most. In other words, we have to shift from being a "people oriented" education enclave to a "student oriented" effort. The failure of an individual to acquire the essentials of a basic and occupational education, I feel is not so much his failure as it is the failures of educators to devise an effective vocational education system. How to inaugurate such a program is not only our greatest challenge today, but yours as well.

APPENDIXES

APPENDIX A

Functions and Definitions of Functions of a Research Proposal or Research Report

by David L. Clark, Egon G. Guba,[*] Gerald R. Smith

PROBLEM:

A. Establishing -- to establish the existence of a situation (e.g., an anomaly, a series of contradictory "facts," unverified findings, or an uncharted area) which suggests a problem.

B. Relating -- to relate the problem to its general antecedents (e.g., educational, scientific, societal, etc.).

C. Qualifying -- to qualify the problem in terms of the special conditions which tend to modify, restrict, or limit its study.

D. Justifying -- to justify the apparent utility, significance, or interest inherent in the investigation of the problem.

OBJECTIVES:

A. Proposing -- to propose the definite goals or ends which the investigator intends to achieve as a result of conducting the research.

B. Justifying -- to justify the selection of the specific objectives chosen for study by naming the criteria employed in making the choice and by showing how the objectives meet the criteria.

LOGICAL STRUCTURE OR THEORETICAL FRAMEWORK:

A. Expounding -- to expound the structure or framework within which the situation will be investigated, that is: (1) in the case of the logical structure, to provide a rationale for the perspective from which the investigator will examine the problem; or (2) in the case of the theoretical framework to conceptualize or state the theory in whose terms the investigator will examine the problem.

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[*] Reference was made to this outline in Dr. Guba's presentation. Dr. Guba on behalf of the co-authors has granted permission for its reproduction here.

Note: Dr. Guba's presentation based in part on a paper, Types of Educational Research, is not presented in this report. The paper, in its entirety, will appear as part of a published volume by another publisher.

B. Validating -- to validate the application of the particular logical structure or theoretical framework in the investigation of the problem in terms of its anticipated advantages and consequences.

HYPOTHESES OR QUESTIONS:

A. Proposing -- to propose the specific questions which will be answered or the hypotheses which will be tested in the investigation of the problem.

B. Validating -- to validate the fact that the questions can be inferred reasonably or the hypotheses can be derived directly from the logical structure or the theoretical framework.

RELATED SCIENCE, KNOWLEDGE, AND PRACTICE:

A. Describing -- to describe the studies and the writings pertinent to the substantive and methodological aspects of the investigation.

B. Critiqueing -- to critique the identified materials in terms of their strengths and weaknesses, as for example, limitations, validity, consistency, inclusiveness, and heuristic value.

C. Relating -- to relate the identified materials to the investigation by (a) showing how the methodology is based upon or differs from known design and measurement principles, and (b) placing the substantive aspects of the investigation in documented historical and scientific perspective.

EXPERIMENTAL DESIGN OR INVESTIGATORY PLAN:

A. Outlining -- to outline the over-all structure within which the investigation will be conducted including the variables which will be considered, the conditions which will be controlled, the processes by which the data will be gathered, the sample, and the sources of data.

B. Detailing -- to detail the design of the analytic procedures and the sample sufficiently to indicate that (a) the hypotheses are tested or the questions are answered unambiguously--the condition of internal validity; and (b) the findings are generalizable to the population or circumstances required by the hypotheses or questions being considered--the condition or external validity.

C. Operationalizing -- to make operational the variables or conditions in the investigation by specifying the instrumentation or the techniques of instrument development including the rationale supporting their selection or development.

D. Qualifying -- to qualify the conclusions or generalizations which can be drawn from the investigation in terms of any special conditions which are inherent in the analytic procedures, investigatory plan, sample, or instrumentation.

WORK SCHEDULE AND RESOURCES:

A. Describing -- to describe the time schedule on which the project work will proceed, the human and technical resources which will be devoted to the work, the physical arrangements which have been or will be made to carry on the work (as, for example, field arrangements for data gathering in school settings), and the fiscal requirements for the conduct of the investigation as described.

B. Justifying -- to justify the adequacy of the personnel and facilities to accomplish the described investigation and the rationale underlying any special conditions or arrangements which are necessary.

FINDINGS:

A. Presenting -- to present the data actually gathered in sufficient detail so that the reader can reconstruct the methodology of the research and assess the data gathered in relation to the plan of the investigation. At this point in the reporting process, the findings should be presented so that the actual data gathered are retained as fully as possible.

B. Examining -- to examine the data completely in accordance with the analytic procedures which have been proposed.

C. Summarizing -- to summarize the findings of the investigation so that all data relating to the hypotheses or questions are presented succinctly, accurately, and with proper qualifications.

APPENDIX B

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by Dr. H. F. Lionberger

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APPENDIX C

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Miller, Robert W., *Schedule, Cost, and Profit Control With PERT*, McGraw Hill Book Company, New York, 1965.

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Murray, John E. "Consideration of PERT Assumptions," *IEEE Transactions of the Professional Technical Group on Engineering Management*, v. EM 10, Number 3, September, 1963.

Analysis of the original PERT statistical assumptions in view of experience gained with the technique. Cites reasons for the establishment of original assumptions and suggests modifications designed to improve the statistical basis.

Phillips, C. R. *Computer Programs for PERT and CPM*. 2d. ed. rev. Technical Paper No. 13. Silver Springs, Maryland, Operations Research, Inc., October, 1963.

Discusses the features of the various computer programs developed for both CPM and PERT. Provides a listing and brief description of programs along with type of machine, resource to contact, etc.

PERT Fundamentals. Washington, D.C., PERT Orientation and Training Center, Bolling Air Force Base, 1964.

A three volume series in programmed instruction format covering the networking (volume 1), scheduling and planning (volume 2), and workbook plus final examination (volume 3).

PERT...Guide for Management Use. Washington, D.C., PERT coordinating Group, Office of the Secretary of Defense.

Description of PERT fundamentals so as to provide for a common means of communication between military, industrial, and governmental users of the technique.

PERT, Program Evaluation Research Task. Summary Report, Phase 1, Washington, D.C., Special Projects Office, Bureau of Naval Weapons, Department of the Navy, July, 1958.

Presents the first phase of the original development of PERT and its theoretical potential for management as developed by the project team of Navy Special Projects Office, Booz, Allen, and Hamilton, and Lockheed Missile Systems Division.

The Impossible, Please
—AND HURRY!

RESEARCH showed the way for modern invention and production, for conveniences and engineering marvels. It was the making of great corporations

RESEARCH brought disease under a degree of control and prolonged the span of life.

RESEARCH put man into space. It will project him to the moon and the planets.

RESEARCH tackles complex mysteries that do not yield to man's reasoning and his accidental discoveries. Progress today comes largely because trained minds search for, and find, pertinent facts that otherwise elude us. In that process, barriers fall and what has been impossible comes to pass.

RESEARCH has no relation to magic. It is painstaking, costly, and slow. It requires scientists, money, and time. Unlike magic, it produces results -- but they cannot readily be guessed, willed, nor scheduled. For who can predict developments and their timing when exploring the unknown?

RESEARCH is neither all-powerful nor infallible, nor do its discoveries always pay off. A majority of industry's new products fail in the marketplace -- but those that succeed keep the firm in business.

RESEARCH may utilize complex equipment and methods, but is successful because of an attitude: seek evidence impartially, weigh it without bias and follow where it leads, welcoming what can be usefully regarded as truth -- but just as readily modifying views when further information broadens knowledge.

RESEARCH constitutes organized search for a better future. Its dividends grow with the scale and skill of research, and with alertness in putting findings to the test of practice.

RESEARCH holds no copyright on its basic philosophy, for we have worked up from the stone age by heeding good evidence. But man's progress is hindered by set ideas, often permitting years or generations to pass before useful knowledge is put to work.

TO HURRY today's obstacles out of the way, it is necessary to proceed in the spirit of research: forget rock-bound opinion, seek facts, and act on the best available information.

Anon.